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# RadCom

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0720
July 2020 • Volume 96 • Number 07 • £4.95

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**C4FM 2m Transceiver**
65Watt 144MHz with AMS 2m Mobile.

ML&S PRICE: **SEE WEB OR CALL**

### Yaesu FTM-7250DE

**2/70 50W C4FM Mobile**

ML&S PRICE: **£219.95**

### Yaesu FT-2980D

ML&S PRICE: **SEE WEB OR CALL**

### Yaesu FT-65E

**VHF/UHF 2m/70cm Dual Band FM Handheld**
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ML&S PRICE: **£79.95**

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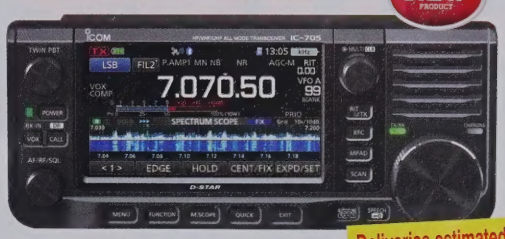
- 4.3" touchscreen colour TFT LCD
- Smooth satellite operation with normal/ reverse tracking and 99 satellite channels
- D-STAR provides clear digital audio
- Voice recording/playback function (SD memory card)
- Audio scope
- CW full break-in

## ICOM ANNOUNCE NEW IC-705 HF/6/2/70 SDR 10W TRANSPORTABLE!

**Icom Japan remove 70MHz from IC-705. See web for update**

NEW PRODUCT



**Latest release from Icom Japan.**

**Deliveries estimated end June/July 2020**

Launched at the Tokyo Ham Fair, this amazing new all mode "all-bands in one box" 5 Watt transportable with internal battery is a full SDR all-mode with large bright touch screen display, Icom's Twin PBT & superb band-scope.

**RRP: £1299.95**

## ICOM IC-7300

**100 Watt - HF/50/70MHz TRANSCEIVER with SSB / CW / RTTY / AM / FM**

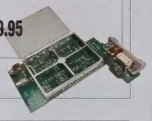
The IC7300 sports HF+6m+4m coverage, it's 100W, houses an eye-catching touchscreen TFT display and includes an internal antenna tuner.

**The World's Best Selling SDR Base**

**PTRX-7300 Now available from stock**

High quality RF interface module allowing the Icom IC-7300 to have a pure RF signal output for connection to an external SDR receiver.

**£189.95**



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## ICOM IC-7610

**The Icom IC-7610 is a complete redesign of the former IC-7600 following on from the huge success of the IC-7300. 100W, Dual band receive and a huge widescreen display.**

- Further evolved RF direct sampling method.
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- DIGI-SEL unit that eliminates excessively strong signals is installed in the main and sub of the receiving section.
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RRP: £3499.95
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**WITH FREE SM-30 DESK MIC**

## ICOM IC-7100

**HF/6m/4m/2m/ 70cm dstar Base & Mobile Transceiver with remote control head unit.**

ML&S PRICE: **ONLY £999.95**

## NEW ICOM IC-R8600

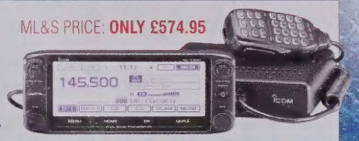
**New 100kHz-3GHz Receiver with SDR technology from IC-7300.**

ML&S PRICE: **ONLY £2499.95**

## ICOM ID-5100

**Latest 2/70 D-Star Touch Screen Transceiver from Icom. Bluetooth connectivity and second station control through an Android device.**

ML&S PRICE: **ONLY £574.95**



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**(Bluetooth) / 3100. Digital DMR Dual-band Handheld Commercial Radio.**

ML&S PRICE: **ONLY £199.95**

### ANYTONE AT-D578UV

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ML&S PRICE: **ONLY £349.95**

### TYT MD-UV380

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*See: www.HamRadio.co.uk/flex*

Following on from the previous range, the new 64/6600 series offer the latest SDR technology housed in a stylish cabinet with or without the inbuilt colour screen and control functions. The ultimate performance direct sampling SDR technology and the best value for the serious HF/6m operator. Designed for the Ham who wants to operate the radio exclusively as a server from PC, laptop, Maestro, Mac, or iOS clients – whether local or remote.

FLEX 6400: **£2179.95**
FLEX 6400M: **£3099.00**
FLEX 6600: **£3999.95**
FLEX 6600M: **£4999.00**

**FREE!**
**Flex-Controller with 6400 worth £169.95**

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### NEW SunSDr2dx

**HF/6m/2m Transceiver.**
The most innovative small-form factor SDR transceiver from Expert Electronics. HF-6-2m, 100W/50W/4-slice receiver, 80MHz Bandscope.

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*Click: HamRadio.co.uk/sdr2dx*

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**The FDM-DUO is a game-changer - a top-end SDR with dials and knobs!**

This transceiver has a 5W output that can operate as a stand-alone unit, without a PC! The small transceiver is equipped with the latest SDR technology.

ML&S PRICE: **ONLY £929.95**

*Also available in special red edition: £974.95* ▲ *Receive only version also available: £729.95*

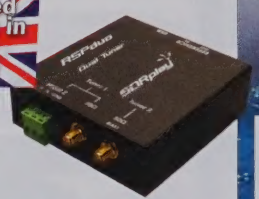
SHUTTLEXPRESS SDR Multifunction Wheel

**Inexpensive customisable wheel that can be configured for use with various SDR programmes.**

ML&S PRICE: **ONLY £44.95**

### SDRplay RSPduo

Designed and built in Great Britain

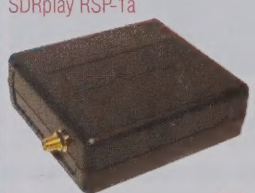



**Dual Tuner 14-bit SDR.**
Dual-Tuner wideband full feature 14-bit SDR, 1kHz to 2GHz, 10MHz of spectrum visibility. Simultaneously monitor 2 separate 2MHz bands of spectrum between 1kHz and 2GHz. 3 software selectable antenna inputs, & clocking features ideally suited to industrial, scientific, Ham & educational applications. Windows 10.

*See www.HamRadio.co.uk/RSPDUO*

ML&S PRICE: **ONLY £239.95**

### SDRplay RSP-1a



**1kHz-2GHz & 10MHz BW.**
Brand new design, the RSP1A is a major upgrade to the popular RSP1 offering a powerful wideband full featured SDR covering 1kHz to 2GHz & up to 10MHz visible bandwidth. Better still, it's "Built & Designed in Britain"!!

ML&S PRICE: **ONLY £99.95**

### SDRplay RSPdx

**Mid-range SDRplay Radio.**
Complete redesign of the popular mid-range RSP2pro 1kHz–2GHz receiver. Multiple antenna selection, Improved pre-selection filters. Even more software, Selectable attenuation steps, Special HDR (High Dynamic Range) mode for reception at frequencies below 2MHz.

ML&S PRICE: **ONLY £194.95** *www.HamRadio.co.uk/sdrplaydx*

### ML&S are the sole UK distributors for the new ZUMspot RPi, an advanced radio module board.

*For more info see HamRadio.co.uk/ZUMspot*

**All ZUMspot Packages supplied by ML&S Include: ZUMspot Pi UHF Board, UHF Antenna, Raspberry Pi Zero WH, MMDVM software and Plastic Case**

ZUMspot RPi **New Updated Version**
ASSEMBLED AND TESTED: **£159.95**
**Featuring DMR, D-Star, C4FM, P25 & NXDN Hotspot.**

**Advanced Radio Module Board. Paired with a Raspberry Pi and the MMDVM software becomes a small and efficient multi-mode digital hotspot.**

### Zumspot Dualband RPi

**(Board only - case included)**

ML&S PRICE: **ONLY £159.95**

### ZumSpot RPi Duplex

**(Top Board Only)**

ML&S PRICE: **ONLY £149.94**

### Zum AMBE Server

**(Board Only)**

Allows for audio transcoding for DSTAR, DMR, Fusion, P25 and NXDN. It also supports some variants of dPMR.

ML&S PRICE: **ONLY £169.96**

### Zum Spot USB!

The ZUM-Spot USB new from KI6ZUM, uses the very popular BlueDv software to create a very versitile and simple to setup PC based hotspot. The ZUM USB comes ready to go with a small antenna and a very classy high quality case, it is a huge upgrade on the very popular DV4Mini and the BlueDV software is the cherry on the cake.

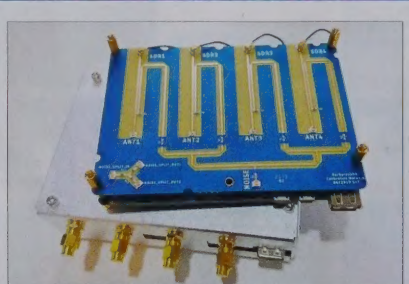
ML&S PRICE: **ONLY £109.95**

### New product: KerberosSDR 4-Channel Coherent RTL-SDR Receiver Only £179.95

**A Coherent RTL-SDR with 4x Channels. For direction finding, passive radar, beam forming, or just as four RTL-SDRs!**

Kerberos have developed a low-cost, 4-tuner phase-coherent RTL-SDR software defined radio. The applications could include radio direction finding, passive radar, beam forming or to simply use as four convenient RTL-SDR dongles. We have developed custom software that shows off direction finding and passive radar capabilities. The base DSP and phase synchronization code could be adapted to any coherent application that you have in mind.

*For more details see HamRadio.co.uk/RTLSDR*



### FUNcube Dongle Pro+

*The Original & Best*

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# Contents

July 2020

## News and Reports

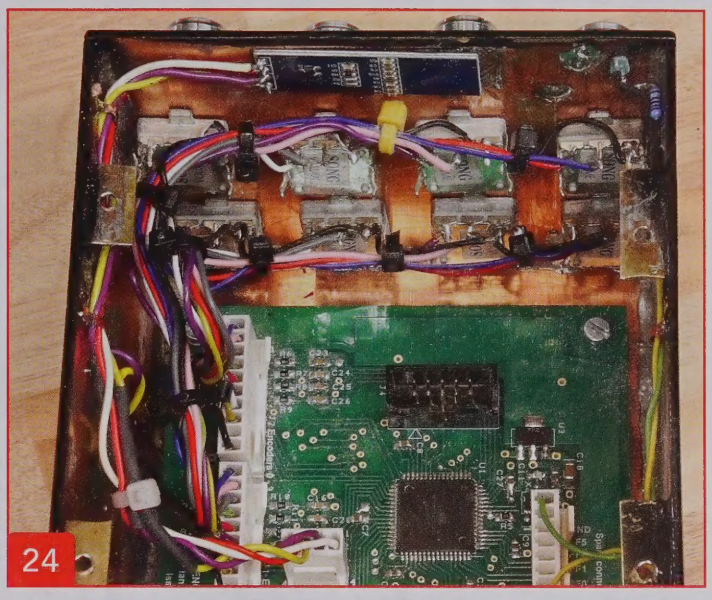

83rd Commonwealth Contest, Bob Whelan, G3PJT 38
Around Your Region – Club events calendar 84
Around Your Region – Events roundup 89
New products 14
News 12
RSGB Matters 6
Special Interest Groups News 16


## Regulars


Advertisers index 93
Antennas, Mike Parkin, G0JMI 54
ATV, Dave Crump, G8GKQ 53
Contesting 22
GHz bands, Dr John Worsnop, G4BAO 64
HF, Martin Atherton, G3ZAY 60
Members' ads 94
Propagation, Gwyn Williams, G4FKH 47
Rallies & events 95
The Last Word 96
VHF / UHF, John Regnault, G4SVX 62


## Features


An alternative to encryption, Peter Davies, M0PJD 68
Get on the air to care, Heather Parsons 37
G0HRS/A, Ian Lowe, G0PDZ 72
QRP, Steve Hartley, G0FUW 48




## Reviews


Book review 69
Siglent SVA-1032X spectrum and network analyser, Mike Richards, G4WNC 42


## Technical Features


Design notes, Andy Talbot, G4JNT 30
EncoderCAT, Ian Sumner, G3VPX 24
Signal and noise, Peter Duffett-Smith, G3XJE 80
Slinky attic doublet, Colin Topping, GM6HGW 66
SPICE circuit simulation, Richard Harris, G3OTK 18
Versatile voltage detector, Klaus Spies, WB9YBM 76

The Siglent SVA-1032X spectrum and network analyser. Photos courtesy Mike, G4WNC. Design Kevin Williams.


RadCom THE RADIO SOCIETY OF GREAT BRITAIN'S MEMBERS' MAGAZINE

**Managing Editor:** Elaine Richards, G4LFM, elaine.richards@rsgb.org.uk
**Technical Editor:** Giles Read, G1MFG, giles@rsgb.org.uk
**Layout and Design:** Kevin Williams, M6CYB, kevin.williams@rsgb.org.uk

**All contributions and correspondence** concerning *RadCom* should be emailed to: radcom@rsgb.org.uk. Alternatively by post to *RadCom* Editor, 3 Abbey Court, Fraser Road, Priory Business Park, Bedford MK44 3WH Phone 01234 832 700, fax 01234 831 496.

*RadCom* is published by the Radio Society of Great Britain as its official journal and is sent free and post paid to all Members of the Society. **The August 2020 edition of *RadCom* is expected to arrive with most Members by 24 July 2020** although this can take up to a week longer in some cases; international deliveries can take longer still.



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*RadCom Basics* for Members new to the hobby can be found at www.rsgb.org/radcom-basics/
Abbreviations and acronyms we use are listed at http://tinyurl.com/RC-acronyms

*RadCom* ISSN: 1367-1499 is published monthly as its official journal by the Radio Society of Great Britain, 3 Abbey Court, Priory Business Park, Fraser Road, Bedford MK44 3WH. Periodicals Postage Paid at RSGB, UK and at additional mailing offices.

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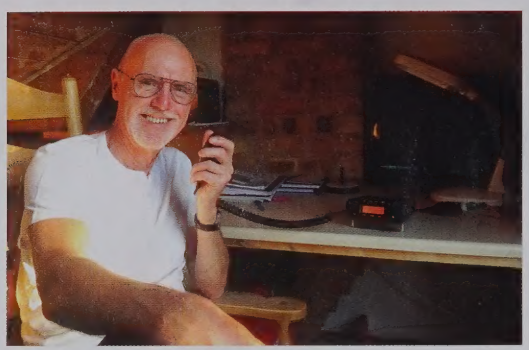
# Remote invigilation of exams



Following our recent announcement about the introduction of a new booking system for remote invigilation Foundation exams, we are pleased to confirm that bookings resumed on Monday 1 June. Exam bookings can now only be made via an online booking form, which is available on the RSGB website at www.rsgb.org/exampay.

On the booking form you can choose your preferred date and time from those shown as available. You will need to pay for the exam when you make the booking. This temporary booking arrangement is only for use during the Covid19 'lockdown'.

We are hoping to introduce remote invigilation exams for the Intermediate and Full licences in the course of the coming weeks. Practical assessments, and other transitional arrangements during the lockdown, are still under review and we will announce any changes as necessary.

In May, 309 candidates took their Foundation exam and 599 candidates are booked for exams in June. This compares with 164 and 147 candidates during the same period in 2019.

In one of the remote invigilated session, one candidate – having passed the exam – expressed a wish to start learning CW. The other candidate, who had also passed, promptly produced a Morse tutor and offered it to his fellow student. It's good to see the amateur spirit alive and well!

One young lady mentioned how she'd been studying with a local club and how welcoming they had been. There was another lady club member and she had helped 'break the ice'. Dave Wilson, M0OBW, RSGB Preisdent (and also one of the main invigilators) said that he hopes all these new licensees will find a welcome in their local clubs once they can all start meeting again.

Dave was also keen to mention how they had been able to help a candidate get his exam completed as he was isolating for two weeks prior to heading offshore for his job as an oil worker.

When lockdown arrived, Pete (see photo) announced that he was 'going for it', bought the Foundation licence book and got down to some self-study. This was augmented by joining the Rugby ATS (although physical meetings are on hold) and self-testing by using online exams. On 8 May, Pete took his Foundation exam, passed, and obtained his callsign M7PAM a week later. Kim, M0KNV has lent him a Yeasu FT-857D, some antennas and a handheld so he is now exploring his 'new world'. He has already bought the Intermediate book and has started to study for that now – not bad he says for 69 years old! Pete has been really delighted (if not a little surprised) by the degree of support and encouragement he has encountered from other amateurs since getting into the hobby, so give him a call if you hear him calling CQ.

## 10m beacon list now available

G3USF's 10 metre beacon list is now available on the RSGB website. Compiled by Martin, G3USF, a former chairman of the RSGB's Propagation Studies Committee, the list helps radio amateurs identify the many hundreds of beacons around the world that are on the air between 28.160 and 28.323MHz.

The list is especially useful in the Sporadic-E season, which generally runs from May to late August.

And you can help too – if you hear a beacon that is not listed please send the details, including callsign, frequency and other information, to PSC.Chairman@rsgb.org.uk

The beacon list can be found at https://rsgb.org/main/technical/propagation/propagation-beacons.

## *RadCom Basics*

The next edition of *RadCom Basics* will be available in June and articles will include:

- Are you making full use of the RSGB?
- GB2RS
- Morse code
- The RSGB band plans and information
- Sporadic-E propagation

There will also be an updated index of *RadCom Basics* articles.

RSGB Members can read previous editions of *RadCom Basics* by going to www.rsgb.org/radcom-basics. You can register to receive notification of subsequent issues as they become available at the same address. Each edition of *RadCom Basics* explores key aspects of amateur radio in a straightforward way. *RadCom Basics* is sent as an email alert to subscribers when each edition is published. This email provides a list of contents and a link to the articles on the RSGB website.

# Don Cameron award

The citation given last month for the 2019 winner, Colin Turner, G3VTT, was incorrect. It should have read, "Colin has been a very active member of the G-QRP community for many years. A good friend of Club founder George Dobbs, G3RJV, he has been contributing to the Club journal, *SPRAT*, since the Autumn 1982 edition. Colin continues to compile quarterly Antennas, Valves and Vintage reports and arranges regular valve based activity days, very often operating with the Club callsign, G5LOW. He is always ready to share his knowledge, skills and experience and has given talks at the G-QRP Convention. There is no doubt, Colin has made an outstanding contribution to low power radio communication." Our apologies to Colin for the error.

## Special event stations

To commemorate the 75th anniversary of VE Day and VJ Day, the RSGB has organised the VE/VJ Day amateur radio marathon on the HF bands and 6m using SSB, CW and digital modes. Three special UK callsigns GB75PEACE, GB1945PE, GB1945PJ will be on the air from 1-31 August. The special stations have their own QRZ.com pages. If you wish to participate and transmit using a VE/VJ Day radio marathon call sign, please contact Ian, GOFCT via csc.chair@rsgb.org.uk Full details of radio marathon and the five awards are on the Society's radio marathon web page, www.rsgb.org/ve-vj-marathon

This is another great initiative that links with the RSGB-NHS campaign 'Get on the air to care', so why not get involved in this commemorative event?

# National Radio Centre news

Whilst the RSGB National Radio Centre at Bletchley Park is temporarily closed due to the Covid-19 restrictions, it has been an ideal opportunity to undertake some general maintenance work and complete a number of projects that were waiting to be finished.

Martyn Baker, G0GMB, the National Radio Centre Coordinator, has installed a Gemini 500 2m power amplifier, kindly supplied by DX Shop, for use with the IC-9700 on the 2m band. The addition of the amplifier will enable the NRC to put out a more potent signal on 2m, be it on SSB, CW or FT8. As well as using the PA to extend the range of tropo QSOs, the NRC is also hoping to be able to run some demonstration meteor scatter QSOs with the higher power available.

Martyn has also installed a new waterproofed patch feed antenna for the QO-100 satellite. After adjusting the feed to align on the focal point of the dish, a number of test QSOs were made, each receiving S9 reports.

# VDSL Interference Complaints to Ofcom

The May 2020 edition of *RadCom* contained an article by Dave Wilson, M0OBW, the RSGB President, encouraging Members who are suffering from VDSL interference, to complain to Ofcom about the interference. We also asked that anyone submitting a complaint to Ofcom to additionally copy it to us by email to VDSL@rsgb.org.uk_so that we could track the number of complaints and, where necessary, assist Members with follow up responses from Ofcom. To date we have copies of over 60 complaints submitted. We want to thank all of you who responded to the President's request to act.

If you are experiencing VDSL interference and have not yet responded to Ofcom, then we urge you to look back at the May *RadCom* or on the website https://rsgb.org/main/technical/emc/vdsl-interference-reporting/ and file your complaint. The articles describe the methods that you can use to identify VDSL interference, including a downloadable software application that specifically searches for the unique signature of VDSL. If you have already responded to Ofcom and have not sent a copy to us then we would be grateful if you would do so as it provides us with evidence that we can use in our discussions with Ofcom.

Ofcom have in the past refused to act against the surge of VDSL interference, in part because of the low number of complaints received. In 2017, an RSGB survey on the same topic generated 1200 responses, with over 600 reporting significant degradation, obstruction, or interruption of received signals. Since then many more VDSL installations have been added, making the interference much worse.

Be prepared to be asked by Ofcom for a log of the stations you cannot receive because of VDSL Interference. One way to collect this evidence is rigorous logging of nets you take part in, recording all the stations whom you called and who could be heard by others at a similar distance away to yourself, but that you could not hear. Why not set up VDSL RFI nets to determine how many stations you cannot receive that others nearby, who have less interference, are able to hear? Ask the people you are calling to log the times they received your calls. Add this evidence to your log, including complaints from them that they could not communicate with you because of VDSL RFI.

We plan to summarising the results in a future issue of *RadCom*. Then we will use the evidence we have gathered to further tackle both Ofcom and Openreach to act against this harmful interference.

If you need any help with identifying VDSL interference, how to make the necessary measurements, or in responding to Ofcom then please email us at vdsl.help@rsgb.org.uk.

## Centenary celebration

**John Armstrong, GW3EJR will be celebrating his 100th birthday on 18 July. He is still active on the air and looking forward to his centenary, even though with the current Covid-19 lockdown his celebrations will be a little different. Happy birthday John.**

# RSGB Operating Awards

Congratulations to the following RSGB Members who have achieved an RSGB Operating Award.

**Eddie, 2E0EVM** – Intermediate 100 Award
**Geoff, G4TQM** – IARU Region 1 Award (Class 3)
**Shane, M1SEM** – IARU Region 1 Award (Class 3)

The following non-Members have also claimed awards.

Oleg, RC2A – Commonwealth Century Award (9 Band, Silver) & IARU Region 1 Award (Class 3)
Terry, VA3CQG – Commonwealth Century Award (9 Band, Bronze) and IARU Region 1 Award (Class 2)
Jan-Martin, LA2BPA – IARU Region 1 Award (Class 3)

Find out more at www.rsgb.org/awards

# New appointments

The RSGB is pleased to confirm new appointments to the Regional Forum. Mark Burrows, 2E0SBM, Regional Representative for Region 13, has been elected unopposed as the Regional Forum Chair.

In addition, Liz Cabban, GW0ETU has been co-opted as the Regional Representative for Region 6 and David De La Haye, M0MBD has been co-opted as the Regional Representative for Region 12. Philip Willis, M0PHI, Board Director with responsibility for the Regional team said, "I am grateful to all three for volunteering their time for these important roles."

# More Convention lecture videos

The RSGB has released two more 2019 Convention lecture videos to its YouTube channel, www.youtube.com/theRSGB

Chris Duckling, G3SVL talks about "*Lessons from the 6Gs VK9XG DXpedition*" whilst Tony Canning, G2NF discusses "*Urban QRM; What can I do?*"

# QSL Matters

Incoming cards from other IARU bureaux have almost dried up. By the end of May, we have only seen input from five countries, the largest being 45kg from DL, with 12kg from JA plus 2kg each from LY, LZ and S5. We've noted a small increase in overseas individuals posting direct to us. A number of countries are ahead of us in opening up again and we anticipate an incoming increase around July.

On the UK side, the numbers of data QSL cards, particular those for FT8, continue to grow, almost exponentially. Members are reminded that the RSGB guidelines say that in fairness to other Members, those with more than 1kg of cards (approximately 300) for a single country, should send direct overseas and not via the UK bureau. Also, that a Member has a yearly free allocation of 15kg of IARU standard size, single page cards, that's around 5,000 total.

Throughout 2019, and with the help of our volunteer sub manager team, we've been attempting to establish a better picture of QSL collection. It's early days but we can already see that some amateurs, both Members and non-Members alike, regularly generate large volumes of cards they don't collect. As an example, the M0A-F group recycled 1,060 cards for 223 callsigns, of which 40% were for non-Members. There are envelopes for 118 callsigns in the group but also 2,225 cards for 288 callsigns that had no envelopes. One M0B call had 228 cards awaiting disposal. Reducing unwanted cards would certainly help to speed delivery for those that do. We would like to see Members and clubs encouraging newer licensees to collect their incoming cards as they're missing out on an interesting area of the hobby. One idea we've heard of is a club night or training session where Members show and tell, using interesting and memorable QSL cards. Highlighting this very point, a message on a card that arrived recently, read: "A *contact and a half. If only such magic happened more often*". The QSO was in 2012 on 10m SSB and obviously worth remembering – nice to know that some people still make friends in the true spirit of the hobby and not just 'rubber stamp' contacts.

2E0BBA's QSL card, complete with RSGB logo proudly displayed, (nice to see) caught our sorters eye this month. Ivo says he loves old minis. How many others remember 'Radio Rescue' mini-vans? A super card and well worth framing.

# "Tonight @ 8" – RSGB launches new live webinars

As another part of our national 'Get on the air to care' campaign with the NHS, we have launched a new series of live webinars. The series is called "Tonight @ 8" and started on Monday 15 June. Initially there will be four webinars, running every other week. The webinars are live-streamed, allowing you to watch the presentations and ask questions online. They will cover a range of topics so whether you've just gained your Foundation licence, are looking for something new to try, or simply want to be up to date with the latest amateur radio ideas and technology, there will be something for everyone. For details of the livestream and the first four webinars go to the special "Tonight @ 8" web page, www.rsgb.org/webinars.

# Beyond Exams

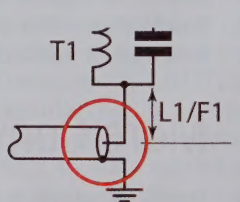
Since the launch nationally of the Beyond Exams (BE) scheme on 30 April, it has been a fun time contacting all the clubs that have been accredited. These have all had a presentation of what the scheme is about and how it works for them. The positive feedback from these has been excellent, from some clubs planning to get on a boat to operate /MM to others thinking of working with a neighbouring club to enter the CQ WPX and CQWW contests. Mark, 2E0SBM the Regional Representative for Region 13 and I have worked together to give the presentations over WebEx, Skype, or any other medium that is preferred by the clubs, and we now have almost all Regions with at least one club on board.

The number of new amateurs taking their exams and returning licence holders, who may have been off air for quite a while, are all saying what an excellent idea this scheme is and how it is helping them find their feet in this hobby. Clubs are getting new members joining, having old members coming in and seeing what is new in the hobby, and with this scheme as a guide are looking at planning activities for all to take part to have a go at something new. All good fun and that is what this is all about. See www.rsgb.org/beyond-exams or email be.coordinator@rsgb.org.uk. **Chris Colclough, G1VDP**

# June errata

The HF Power Meter with Optional Magnetic Loop Controller article contained an error in the circuit diagram. R10 should be 560Ω and not 10k as shown.

In the Antenna Traps article, the coax in Figure 2 was drawn incorrectly; it should be as shown above right. There were also errors in the formulae in Figure 3. They should have read as shown on the right:




$$Z = \sqrt{R^2 + X^2} \qquad X = \frac{1}{2\pi fL - 2\pi fC}$$

$$I = \frac{V}{Z} = \frac{V}{\sqrt{R^2 + \left(2\pi fL - \frac{1}{2\pi fC}\right)^2}}$$

# WRC-23 Preparations begin

Preparations for WRC-23 are already in full swing and the top amateur priority is to protect our tenure in the Secondary 23cm allocation. There are, as always, several other items that may also potentially affect our allocations. Details of these are now collated together on a new special focus page on the RSGB website for WRC-23/27 at https://rsgb.org/main/news/special-focus/wrc-23.

For WRC-23, Agenda Item 9.1b will consider technical and operational measures to be applied to amateur usage of the 23cm band to ensure the protection of the Primary radio navigation satellite service (RNSS), principally the Galileo system. Initial IARU contributions characterising the use of the band by the amateur service have been welcomed in the CEPT SE40 technical working group. Considering the profile of amateur usage in the band, the IARU takes a view that the potential for large-scale interference to RNSS is overstated, but is working with all parties in a good spirit of cooperation.

In the past few weeks, the top level CEPT Conference Preparatory Group (CPG) has met electronically, confirming that the 23cm topic will be considered by Project Team C (CEPT-PTC), drawing on ongoing technical studies that started last year in SE40.

RSGB Microwave Manager Barry Lewis, G4SJH is one of many involved in this challenging task. Other agenda items of interest or concern include those arising from new aeronautical proposals, space-weather, protecting the lower DX edge of 50MHz from new radar sensors and more demands on the microwave and millimetre wave bands. Other volunteers remain busy on ongoing matters such as Wireless Power in both CEPT and further afield in CISPR.

Meanwhile the Final Acts for WRC-19 were recently released, and come into force in January 2021. This has brought welcome progress as Germany, Saudi Arabia and others start to implement the successful changes achieved for the 50MHz band in Region 1.

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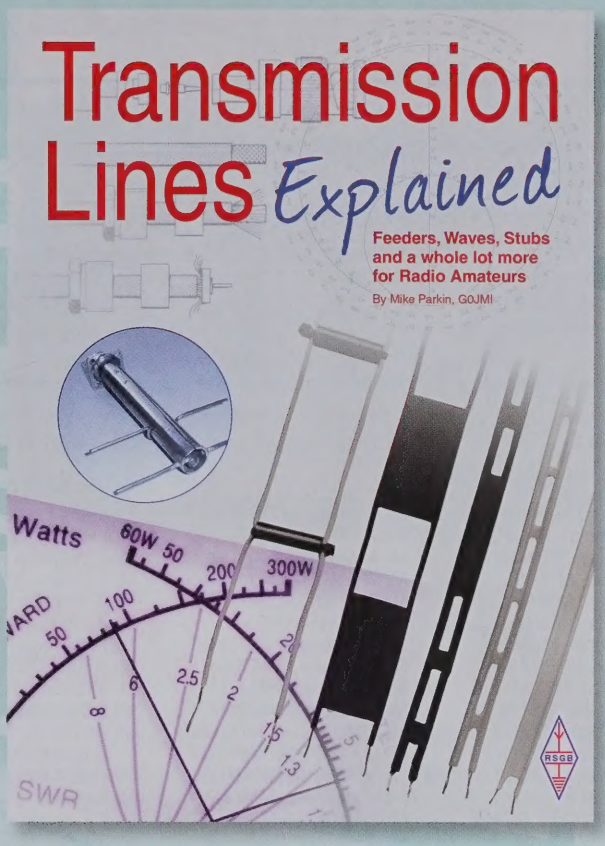


# Transmission Lines Explained

*Feeders, Waves, Stubs and a whole lot more for Radio Amateurs*

By Mike Parkin, G0JMI

Getting the signal from your radio to the antenna is a vital component of any radio setup but few understand the full impact their feeder is having. This is where *Transmission Lines Explained* steps in providing through descriptions and techniques rather than mathematics the theory involved.

The aim of this book has been to provide an understanding of the theory, operation and use of transmission lines where twin-line cable or coaxial cables are used, not only as antenna feeder cables, but also as a basis for the matching arrangement between a line and its load. Broken down into logical sections *Transmission Lines Explained* covers twin-line and coaxial cable transmission line types, including examples of how transmission lines can be constructed to suit particular applications. Techniques are included to summarise how coaxial cables can be fitted with connectors, including BNC, N and PL259 types. There is a section covering the use of the Smith Chart where the effect of a mismatched load on a transmission line is described through several practical examples. There are of course mathematical explanations of what is needed in given situations. Explanations of the coefficients associated with transmission lines are provided which sets the basis to describe how a mismatch between the transmission line and its terminating load results in a reduced power transfer and the consequence, a standing wave pattern. Details are provided covering how different impedances can be matched using sections of transmission line, common mode currents, their effect and how they can be minimised using baluns.

*Transmission Lines Explained* is intended as the ideal compilation of techniques, descriptions and examples so that radio amateurs can gain an understanding of the concepts associated with a transmission lines.

**Size: 174x240mm, 136 pages. ISBN: 9781 9101 9387 7**

**Non Members: £12.99, RSGB Members: £11.04**

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## Congratulations

To the following Members whom our records show as having reached 70, 60 or 50 years' continuous Membership of the RSGB.

### 70 Years

Mr G Halse G3GRV
Mr F Robins G3GVM
Mr D F Willies G3HRK

### 60 Years

Mr R Wheeler G3MGW
Mr R Mason G3TDM

### 50 Years

South Manchester R&CC G3FVA
Mr I S Davies G3KZR
G R Browne G3MMJ
Mr N Van Weede G3VNC
Mr R H M Outwaite G3YVV
Mr D Wicks G3YYD
Mr J C Cuthbert G3YYZ
Mr J Kirk G3ZDF
Dr R S Walker G3ZJQ
Mr R J Sobey G4AER
Mr J Clifford GW4BVE
Mr F Partington G4BZP
Mr K F Davies G4CGR
Mr R J Baker G4DJC
Mr D Couse G8ILW
Mr M Evans GW3UCJ
Mr T R Sanderson PA3BOH
Mr J A Niblock RS27873

## The RSGB welcomes to the RSGB family the following new Members who have joined their voice to ours, helping to keep the RSGB strong.

Mr R Walsh, 2E0AOO
Mr L Allcock, 2E0FKT
Mr G Cullum, 2E0FNP
Mr J Claridge, 2E0JJC
Mr R Hewson, 2E0MMX
Mr A Thorpe, 2E0THP
Mr A Bloomer, 2E0XMB
Mr R Cook, 2E0YWN
Mr R Pitts, 2E0ZWH
Mr J Hallam, 2E1HKO
Mr A Edwards, 2E1LGA
Mr R Prime, 2W0FFN
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Mr G Miller, K5GHM
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Mr P Humphrey, M0EAS
Mr R Home, M0ETE
Mr A Jamieson, M0IJP
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Mr R Jones, M3FNW
Mr K Kostas, M3HXW
Mr M Hooper, M3IWH
Mr J Cook, M3SUJ
Mr J R Mee, M6DXI
Mr D Roberts, M6TJQ
Mr V Wheatley, M7AIV
Mr A Rudgley, M7ALR
Mr S James, M7AOC
Mr R Nicholson, M7APC
Mr P Richardson, M7APF
Mr K Sperry, M7APL
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Mr C Walker, M7ASL
Mr A Little, M7ASL
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Mr P Holliday, M7CKP
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Mr S Jackson, M7FTW
Mr G Wills, M7GDW
Mr J Anderson, M7JDA
Mr J Bailey, M7JRM
Mr J Willis-Fisher, M7JWF
Mr M Hall, M7MJH
Mr L Bennett, M7MLB
Mr L Ponton, M7NEZ
Mr N Wadsley, M7NOW
Mr O Acton, M7OJA
Mr O Botwright, M7OLY
Mr A Gatarek, M7PLE
Mr C Rockey, M7ROC
Mr J Jordan, M7RXM
Mr S Holroyd, M7SRE
Mr S Walters-Smith, M7SWS
Mr T Griffiths, M7TGF
Mr R Saddler, M7UPE
Mr P Simcox, M7VCZ
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Mr A Wigham, M7WGM
Mr W Sowerbutts, M7WRS
Mr D Mitsinikos, M7XDM
Mr N J Orr, MI3VFJ
Mr A McKenzie, MI7MCK
Mr N Higgins, MM3NDH
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Mrs G Britten-Jones, MW7GBJ
Mr K Ucele, MW7KUL
Mr W Dabrowski, MW7WAD
The Online Radio Club, MX0ONL
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Mrs V See, N5LPL
Mr K Brookner, NS7V
Mr M Williams, OK8OME
Mr D Brown, RS195704
Mr L Rotondi, RS304998
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Mr N Smith, RS324649
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Mr N Grainger, RS331549
Mr R Wilson, VK1ER
Mr B Conner, VK2NQ
Mr M Leed, W7KKM
Mr L Plumb, WA2TLY
Mr J Raia, WX1FLY
Mr M Nicolau, YO3VU

## The RSGB would like to welcome back the following Members who have rejoined the Society.

Mr D Teasdale, 2E0DBZ
Mr R Lyddall, 2E0DPZ
Mr B Smith, 2E0PXW
Mr A Lane, 2E0SDR
Mr J McMullen, 2E0TDR
Mr A D Lunn, 2E0ZGL
Mr A Doyle, 2W0YLE
Mr J Desmond, EI7GL
Mr J M Idee, F5SGI
Mr S Webb, G0AEN
Mr D Lucas, G0BIE
Mr T Wookey, G0CCP
Mr D Warren, G0FKX
Mr S Jones, G0FMZ
Mr R Stennett, G0HFN
Mr A Puffett, G0JVH
Mr S Markwick, G0MUC
Mr O T Wheeler, G0NCE
Mr C Hewitt, G0PAE
Mr I Burden, G0RRI
Mr R Arnold, G1GRB
Mr L Heller, G1HSM
Mr E Giacani, G1KSW
Mr M Halloway, G1NRF
Mr J Page, G1POS
Mr A Venables, G1RFI
Mr G Hodgkins, G1UGX
Mr L Calcraft, G3SEW
Mr B Curnow, G3UKI
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Mr O Dawson, G4ELA
Mr M White, G4HZG
Mr J Norris, G4JEN
Mr D Burrell, G4KTR
Mrs C Bell, G4KVR
Mr A Forster, G4NNJ
Mr M Judd, G4PLP
Mr D Meaker, G6FFB
Mr G Weston, G6LJC
Mr S Nightingale, G6XLR
Mr K Baum, G6ZDP
Mr R Avis, G7DKW
Mr R Cook, G7IQD
Earl D A Webb, G7JAK
Mr N Deacon, G7KMK
Mr A Brown, G7KMW
Mr K Gatfield, G7OUG
Mr S W Mumby, G7OWE
Mr J A Keen, G7PZT
Mr M Mussard, G7TOU
Mr G Smith, G8DST
Mr K Clarke, G8NHR
Mr D Lee, G8PWA
Mr T A B Armstrong, GM0EHL
Mr C Makin, GM0SIZ
Mr M Craig, GM6BEY
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Mr P Wildey, M0DOG
Miss A Holmes, M0EDE
Mr N Mumby, M0OWE
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Mr A Jakstas, M0PZD
Mr M R Meal, M0RGM
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Mr K Heselton, M1EMC
Mr T Street, M1EZY
Mr K Mahoney, M1KEV
Mr P G Lockwood, M3PGL
Mr K Reeves, M6AYW
Mr D Timbrell, M6DTT
Mr R Young, M6KKI
Mr P Ellison, M6PFE
Mr R Page, M6RKP
Mr R C Muir, M6UIR
Mr T Whelan, M6XAT
Mr A K Williams, MW0RDF
Dr D Lloyds, MW3YDR
Mr J Sampson, N5LXI
Mr A Hoebeke, ON4MHO
Mr D Packman, RS158762
Mr M Wilson, RS182685
Mr G Boon, RS205760
Mr M A Whiteley, RS208880
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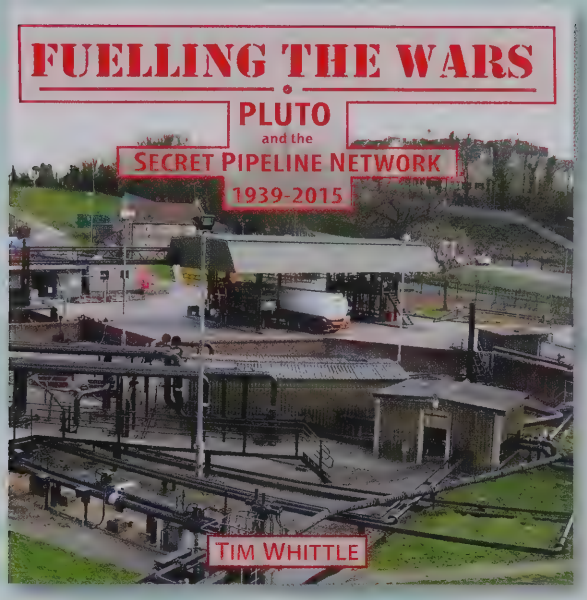
Mr L Guenther, W4FCU
Mr C P Maulick, WB2YZX




RSGB SHOP

# Fuelling The Wars

## *Pluto and the Secret Pipeline Network*

By Tim Whittle

This hardback book is a fascinating insight into something entirely unknown to many, the UK's network of petroleum pipelines transport fuel from refineries and terminals to major airports, airfields, and distribution depots. The largest of which has its origins as far back as the Second World War and is one of the few remnants, still operational, of the vast infrastructure that was built to fight that war.

In 1936 the RAF had total fuel reserves that amounted to just 8,000 tons. With a potential war in sight a programme for the construction of protected storage depots was started with the first of these coming on-line in 1939. In total the Air Ministry constructed 78 new storage depots with a total capacity of over 1.6 million tons. Possibly the best-known part of the network are the PLUTO cross channel pipelines. However, they were not as successful as popularly imagined, and the battle of Normandy was won without a drop of fuel being delivered by the pipeline. Immediately after the war most of the government system was decommissioned, but the 'Cold War' led to its reuse. In the 1950s new import facilities, civil storage depots (including large scale fuel reserves located in salt cavities) and pipelines were constructed. Increasing amounts of commercial fuel was also carried, with the system supplying fuel to both Heathrow and Gatwick airports. Following the end of Cold War, many more depots and some pipelines were closed. The use of the network for commercial aviation fuel, increased so new aviation fuel import facilities were connected to the system.

This pipeline network and storage system has constantly adapted, evolved and transformed itself. Fuelling the Wars sets out to chart how the system came to be built, its history and its continuing importance today.

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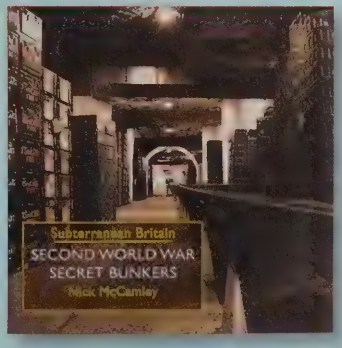
## Second World War Secret Bunkers

This comprehensive hardback book provides an overview of all the major underground sites developed in great secrecy by the British government and military establishment in preparation for the Second World War. Lavishly illustrated with over 450 pictures reproduced on a high quality paper and accompanied by comprehensive captions and an authoritative text this book provides a fascinating guide to these structures.

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# CQ Amateur Radio Hall of Fame

The CQ Amateur Radio Hall of Fame has seven new members for 2020. It honours those individuals, whether licensed amateurs or not, who have made significant contributions to amateur radio; and those amateurs who have made significant contributions either to amateur radio, to their professional careers or to some other aspect of life.

The 2020 inductees (listed alphabetically) are:

- **Chet Atkins, W4CGP** (SK), legendary musician known as Mister Guitar, and music producer; (Note: Chet's call has subsequently been re-issued).
- **Les Barclay, G3HTF** (SK), propagation expert, leader of International Telecommunication Union propagation study groups and Chairman of the ITU's first Radiocommunication Assembly in 1993; top official in the UK's telecommunication regulatory agency.
- **George Laurer, K4HZE** (SK), developer of the UPC (universal product code) or bar code on merchandise, permitting items purchased at stores to be scanned on checkout rather than manually rung up.
- **Yasuo Zorro Miyazawa, JH1AJT**, whose Foundation for Global Children helps fund educational and medical programs for children around the world; FGC also works with several countries to help them organise and train teams for the Olympic Games and Paralympic Games.
- **Champ Muangamphun, E21EIC**, is a DXer and DXpeditioner who has been a sparkplug for growing interest in ham radio in Thailand and throughout Southeast Asia; Champ also accompanies JH1AJT on many of his humanitarian missions and operates DXpedition-style ham stations while Zorro works with government officials and non-governmental organizations on behalf of the Foundation for Global Children.
- **Sultan Qaboos bin Said, A41AA** (SK), Sultan of Oman from 1970-2020; transformed impoverished country into a modern and prosperous state with influence throughout the Middle East.
- **Tom Roscoe, K8CX,** a champion of amateur radio history who collects and makes available online his Ham Gallery of old QSL cards and other historic photos.

# RMS Titanic radio room

A federal judge has said that RMS Titanic Inc can go forward with its plan to cut into the *Titanic* shipwreck and try retrieving the Marconi wireless telegraph machine that sent out distress calls 108 years ago.

RMS Titanic Inc is the court-designated salvage firm for the *Titanic* and made its case that the radio had enough historic value to justify sending a specially equipped robot into the wreck. The remotely operated submersible would be equipped with tools to cut through the deckhouse if necessary.

# II2EMCA

**Special callsign II2EMCA to commemorate Emilio Caimi.**

**The station will be active – CW only on the HF and WARC bands – from 1 July until the end of the year. It is to commemorate Emilio Caimi (Milan 1876 – 1963), the Morse key maker, who supplied the Italian Royal Air Force (Regia Aeronautica) since 1932.**

**QSL direct via IZ2FME and Logbook of The World.**

**More information from iz2fme@amsat.org.**

# XN1BOA

XN1BOA was a special event station celebrating the 75th anniversary of the end of the Battle of the Atlantic – it coincided with the UK celebrating the 75th Anniversary of VE Day. Joe, VO1BQ had emailed the RSGB National Radio Centre at Bletchley Park several months ago looking to make contact with GB3RS at Bletchley Park. Whilst on a maintenance visit to the NRC, co-ordinator Martyn, G0GMB took the opportunity to make a 20m SSB sked with Joe. The XN1BOA activation concluded with 1,145 QSOs in 70 countries.

# CQ DX Hall of Fame

The CQ DX Hall of Fame was established in 1967 to recognise those amateurs who have made major contributions to DXing and DXpeditioning. This is the 54th annual induction, and the first to be conducted online. The 2020 inductees to the CQ DX Hall of Fame are:

**Tony Gonzalez, EA5RM:** An active DXpeditioner for 20 years, often organising and leading teams to operate from difficult and challenging locations. Tony and his teams have also helped establish or re-establish amateur radio activities in several countries, including Rwanda and the newly-independent country of South Sudan.

**Edward 'Ned' Stearns, AA7A:** An accomplished DXer, DXpeditioner and technical innovator. He introduced the use of switchable vertical dipole array antennas on island DXpeditions and designed 'dual-band discone' antennas for use with the Northern California DX Foundation's worldwide beacon network. Ned also worked with Joe Taylor, K1JT, on developing the "Fox/Hound" mode for FT8 used by DXpeditions.

# G-QRP Conventions postponed

Due to the ongoing uncertainty about restrictions on travel and large gatherings, and concerns about vulnerable people needing to shield for sometime to come, the G-QRP Club has decided to postpone its 2020 Conventions. The Club had planned to hold two Conventions this September; one in Telford and one in Prestwick.

Plans are progressing to host an online Convention in September. This is likely to include a series of QRP talks and maybe a virtual Buildathon. The G-QRP Club will make further announcements as soon as the arrangements have been finalised.

# Changes at SOTABEAMS

During the lockdown period there has been a major change at SOTABEAMS. Richard, G3CWI has decided to retire and his colleague Martin Jackson has taken over as Managing Director. Richard will still be around in the background, of course, but the day to day running of the company will be done by Martin. After taking a bit of a break he intends resuming his Radio Adventures video series.

Martin is an engineering graduate and has worked as SOTABEAMS Technical Director for four years. Martin has developed some of our most popular products, such as the WSPRlite and the WOLFWAVE.

Martin can be contacted via martin@sotabeams.co.uk. For technical support, please use support@sotabeams.co.uk.

## Churches and Chapels On The Air

**Churches and Chapels On The Air (CHOTA) will take place this year on Saturday 12 September. The organiser, John, G3XYF has been in touch with Ofcom and they have waived the rule that Special Event Stations must allow access to the public. Ofcom are quite happy for holders of GB calls to operate from their home stations. If anyone is intending to operate a GB call for CHOTA this year please let John know by email to jhwresdell@gmail.com.**

## GB2RAF

The Air Defence Radar Museum at RAF Neatishead runs a permanent special event station, GB2RAF, when the museum is open. During the Covid-19 lockdown, G4PSH has obtained permission to operate GB2RAF from his home QTH under Ofcom Temporary Licence 1-68D-2038 until such time as the Museum is open to the public again. QSL card information is as previously, via RSGB bureau, RAFARS QSL Bureau, eqsl.com or direct to G4PSH (QTHR with a SAE).

# RCF Scholar helping the NHS

Jake Howarth, MOJKE is doing his bit to help out the NHS in lockdown. The RCF Trustees were delighted to hear that the 3D printer he purchased using his Arkwright Engineering Scholarship funds has been put to great use. Not only has it helped him in pursuing his own projects, but it is also enabling him to contribute to society by producing PPE as part of the 3D-Crowd initiative.

Jake said "I am currently producing face shields (of Josef Prusa's design) from PET-G filament. PET-G is used so the masks can be cold autoclaved, and our local hub is handling the distribution to hospitals. Aside from this, I am also building another 3D printer which utilises CoreXY kinematics to achieve greater speeds than a traditional Cartesian setup whilst maintaining a high print quality. The design I am using is the HyperCube and I hope to have it operational within a few weeks."

The RCF sponsor two or three Arkwright Scholars each year and many have taken up amateur radio as a result. Jake was already licensed when he was selected and he was a UK representative at the 2019 IARU YOTA event. He is clearly continuing to do good work and a credit to the amateur radio community and the Arkwright Scholarship scheme.

You can help the RCF continue their work by donating via the RCF website, www.radiocommsfoundation.org.uk or the RSGB shop. Because the RCF is a charity, donations qualify for Gift Aid.

## Dante Alighieri award

To celebrate the works of Italian poet of Dante Alighieri, sections of the Italian Radio Amateurs Society has organised a diploma as part of the celebrations for the 700th anniversary in September. Participation in the diploma is open to all radio amateurs and SWLs and will be awarded to those who will contact or activate "Dante places", geographic places cited in the *Divine Comedy*. England and Scotland are both cited and, therefore, radio amateurs living in those countries can participate in the diploma activities as 'activators'.

For further information about the Diploma, please refer to the website www.diplomadante.it or email info@diplomadante.it.

## GB13COL

Durham and District Amateur Radio Society is participating as one of the bonus stations in the 13 Colonies Special Event. The special callsign GB13COL has been issued for this event and will run from 1300UTC on 1 July to 0400UTC on 8 July. The primary focus of the event will be the HF bands using SSB, CW, FM and various digital modes, but VHF and UHF will also be in use. The 13 Colonies event began in 2009 as a way of celebrating American Independence with the original 13 colony States circa 1776. Since the UK was a major historical player in the Revolutionary War, GB13COL from England will present an added positive flair, historical significance and a challenge for radio amateurs to contact. This year's QSL cards for GB13COL has been kindly sponsored by Martin Lynch at ML&S.

# Lockdown stories

**At the end of May, the BBC News website reported on a student who was restoring vintage radios during lockdown.**

**The teenager, who restores and repairs old radios, said he loved the 'unexplained charm' and history of the wireless. Diogo Martins, from Oadby, Leicestershire, has been able to spend more time on his hobby during the Coronavirus lockdown and has added to his collection of vintage radios. "Without a doubt many of these radios have a family history where families have gathered around to listen to music and information, and it's that history which I find so endearing," he said. The 19-year-old electrical engineering student said in restoring them he is "continuing their legacy".**

**Let us know about any other interesting lockdown stories via email to radcom@rsgb.org.uk.**

# New Products

## SDR-Kits Network Analyser

SDR-Kits has launched a full 2-port version of the VNWA3 Vector Network Analyser. Inclusion of a solid-state 2-port switch eliminates the need for manual reversal of the device under test allowing forward and reverse measurements to be taken with a single key click. The 2-Port VNWA3SE comes standard with SMA connectors but a N-connector version will also be available. Both models use the same solid 2mm anodised enclosure but are twice the depth of the existing VNWA enclosure hence offering improved stability. Existing VNWA3 or 3E owners can upgrade their VNWA to 2-port with upgrade kits expected to be available from August 2020. www.sdr-kits.net.

## AR5700D Receiver

AOR's AR5700D digital communications has a new feature that will interest commercial users: a GSSI user group filtering function for trunked TETRA network reception. The AR5700D is a 9kHz-3.7GHz high-performance communications receiver for commercial and governmental applications, such as wide-band signal detection, monitoring, voice decoding, digital I/Q recording and playback.

The AR5700D decodes many digital protocol signals such as TETRA (Direct mode, trunked mode with GSSI), DMR, NXDN (with 15bit descramble), D-Star, DPMR, APCO 25, Yaesu, Alinco, D-CR, and of course it receives traditional analogue signals such as FM, FM-stereo, AM, synchronous AM, USB, LSB, CW, analogue I/Q and FM video. It is fitted with four Renesas SH2 CPUs, three Analog Devices Blackfin DSPs, one Analog Devices ADSP-2185 DSP, and four Intel (Altera) Cyclon FPGAs for powerful signal processing, demodulation and decoding. In the UK, Waters and Stanton are the main importers of AOR equipment. https://hamradiostore.co.uk/

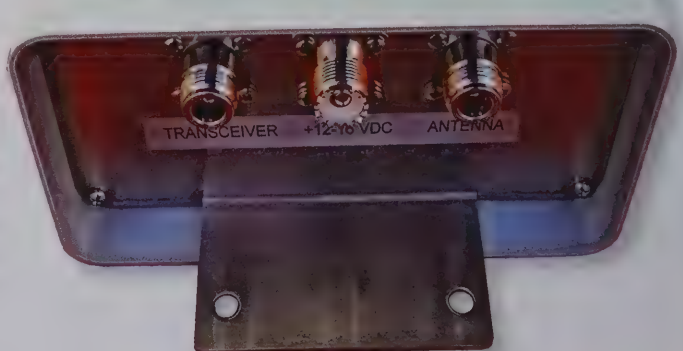
## UK distributor for RFinder B1

Moonraker has been appointed the UK distributor for the new RFinder B1. It is a dual band (VHF/UHF) DMR transceiver combined with an embedded powerful Android smartphone. It covers 136-174MHz and 400-480MHz. Delivering up to 4 watts of RF power out of its very robust case, you can use all the available Play Store apps, which means that you can install Zello, Team Speak, EchoLink and many others – and use the built-in PTT button to key the transmission on such apps. The first delivery is expected in June and it costs £999.98. More information, including the full feaures can be found on the Moonraker website, www.moonraker.eu.

## BEKO masthead preamps

Nevada is now stocking the BEKO masthead preamplifiers from Germany. There are preamplifier models for both 2m and 70cm, both having the ability to take up to 2.5kW of through-power. They are of high quality construction using a pair of relays that contain ceramic and PTFE linings.

The HPP-144 (2m version) provides a noise figure of 0.5dB, with the HPP-432 (70cm version) offering 0.8dB NF. Both preamplifiers have fixed gain of 20dB and IP3 of 22dBm. They are narrow band, with filters built in to reject FM broadcast and other services. Voltage can be fed through the coaxial cable via in built T bias system, or a separate feed to the unit. Both models sell for £669 each and are available from www.nevadaradio.co.uk.



## IC-705 update

Icom have announced details about the launch of the IC-705 QRP SDR ultra-portable transceiver. Stock will be available to the Japanese amateur community from the middle of June and deliveries are planned to the rest of the world shortly afterwards.

This new 'go anywhere' HF/VHF/UHF has an SDR platform, internal battery, GPS, Bluetooth and D-Star, in a compact and lightweight body. It uses the same 4.3in colour touch screen display as the IC-7300 and IC-9700 and features a real-time spectrum scope and waterfall display.

The UK version of the IC-705 is expected to arrive soon after the Japan launch and Icom UK anticipates a price of around £1299.99 including VAT (subject to confirmation). Icom UK encourages you to sign up to their newsletter or their social media channels for news updates regarding this model.

For more details about the IC-705 including a video introduction to this product, visit the IC-705 QRP SDR transceiver Product Page on the Icom UK website www.icomuk.co.uk.

## Next generation RF signal generator

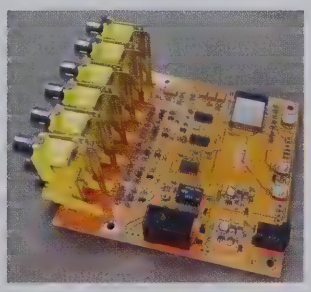
SIGLENT
TO SOLVE THE RF DESIGN PUZZLE
YOU NEED THE RIGHT PIECE
Phase Noise: <-120 dBc/Hz @ 1 GHz, 20 kHz offset
Support external / internal Baseband modulation

A new series of Siglent signal generators is available, with a maximum output frequency up to 6GHz. The series is split in two versions. The SSG5000X is a classical analogue RF generator and a second version is the SSG5000X-V, that has Vector Signal Generation capability. The V-Version features internal I/Q modulation with an RF modulation bandwidth up to 150MHz, as well as an arbitrary waveform playback function. The menu structure makes it easy to create even the most complex signal types.

The phase noise specification shows -120dBc (at 1GHz / 20kHz offset), the levelled maximum output level goes up to +20dBm (unlevelled up to +26dBm); the minimum output level is -130dBm (settable down to -140dBm). With the optional OCXO module it is possible to improve the temperature stability enormously.

The base unit of the SSG5000X comes with a 5" touch display. The SSG5000X incorporates a web server for easy remote control over Ethernet. The analogue RF Generator offers all analogue modulation types including pulse modulation as a standard feature. Different types of frequency or amplitude sweeps can be set and combined. The Signal Valid and Trigger In/Out BNC connectors on the back side enable a smooth and easy implementation into automated test systems. All units support the connection of an external USB power meter in order to compensate the path loss between the RF out of the generator and the DUT. For more details and pricing contact Telonic Instruments, www.telonic.co.uk.

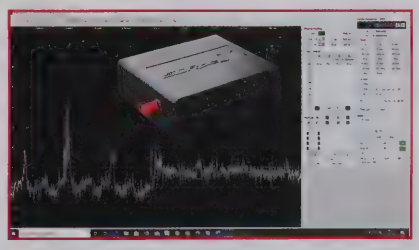
## HAMKit VMAC ESP32



The HAMKit VMAC ESP32 is a small but powerful board, driven by an ESP32, which provides a very flexible audio and video switching matrix, with on-board DTMF decoder, OSD graphics, video signal detectors and synchronous bucks. It also has options to use stacked RCA or BNC riser sockets.

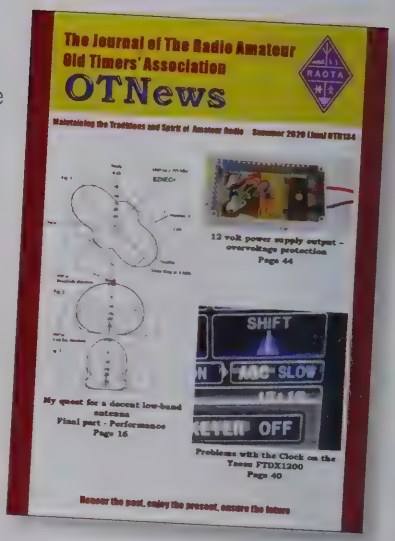
The HAMKit VMAC ESP32 is easily software controlled from the on-board ESP32 WROOM 32D. Software can be easily developed such as using the Arduino IDE, Visual Studio Code and Platform IO IDE, Espressif IDF or Espressif ESP RainMaker. Home automation via MQTT a great opportunity too for the ATV station or remote ATV/DATV repeater control. Further details maybe found at http://hamkit.co.uk.

## SDRplay Spectrum Analyser software



SDRplay has announced the release of V1.1 of the Spectrum Analyser software developed by Steve Andrew specifically for the RSP line of products. This adds support for the newer RSPdx model and offers new trace difference and normalisation modes. This Windows-based software can turn a low cost SDR receiver into a powerful calibrated lab tool. The software allows scanning over any range between the operating limits of an RSP along with the normal sample-and-hold features you would expect in such a device. All RSPs work from 1kHz to 2GHz. It displays 3.5 to 4MHz with a combination of good signals, EMC interference from a nearby 2kW "pure sine wave" inverter and BT broadband interference. This new software will work with all RSP models including those no longer in production. www.sdrplay.com.

# Old Timer News


The Journal of The Radio Amateur Old Timers' Association
OTNews
12 volt power supply output – overvoltage protection
Page 44
My quest for a decent low-band antenna
Final part - Performance
Page 16
Problems with the Clock on the Yaesu FTDX1200
Page 40

The Radio Amateurs Old Timers Association has published the latest edition of *Old Timer News* (issue 134). *OTN* consists mostly of articles written by RAOTA members. This issue includes:

- How to Twiddle your AMU or Why You Should Forget About Conjugate Matching
- My quest for a decent low-band antenna; final part – performance
- Power and SWR measurement
- Problems with the Clock on the Yaesu FTDx1200
- A Fresh Insight into Doublets, Matching & Standing Waves

Membership of RAOTA is open to *anyone with an active interest in amateur radio*. There are two categories of membership – Associate and Full. Associate membership is open to anyone (licensed or listener) with an active interest in amateur radio *regardless of how recently* they came into the hobby. Full members have a vote in the running of RAOTA and is open to anyone (licensed or listener) with at least 25 years experience in amateur radio.

Enquiries about membership should be sent to George Miles, G3VBE, via memsec@RAOTA.org or QTHR and there is more information at www.RAOTA.org.

# GB75VED

With permission from Ofcom, the Royal Air Force Amateur Radio Society held and operated the Victory In Europe special event station GB75VED

The callsign was originally destined to be operated from RAF Cosford at the Defence College of Aeronautical Engineering (DCAE), the RAFARS HQ Building. This was not possible due to restrictions around the Covid-19 pandemic. So, operation of the station was effected by utilising several different volunteer operators from RAFARS ranks, in many different locations the length and breadth of the country.

This has proved to be a very popular SES, which ran for 28 days in May, not only eliciting much interest from the UK but all over Europe and the rest of the world. I was privileged to set off the event on the 1st and then again on VE Day itself, the 8th of May. One of the highlights was working a German station, Matthias, DJ7RS, using Morse, via vintage wartime equipment to wartime equipment. I was utilising the BC-191 ground-based transmitter and BC-312N receiver (c1944); he was using a German submarine Tx, the Lorenz Lo40K39 plus the Lo 6K39, a 3-V-1 receiver. The QSO happening at 1500UTC, the historical time that Winston Churchill announced to the nation the end of the War in Europe.

It was good to meet in the true spirit of amateur radio and I can safely say that both stations felt a lump in the throat remembering such history on radio – and a new friend was made. Thank you to all stations who called in on the 1st (128 stations) and the day itself, 8 May, (146 stations). All were reminded that QSL information is located on the RAFARS website, www.rafars.org.uk.

Stuart, G0TBI
RAFARS HQ Station Manager (operating from home QTH)

# BYLARA

The British Young Ladies Amateur Radio Association (BYLARA) was founded in April 1979 to further YL operating in Britain and so promote friendship, stimulate interest and, in particular, encourage good operating techniques and courtesy to all operators at all times.

Awards are available for working BYLARA Members and other YLs and with many amateurs getting on the air during the lockdown, now is a good time to participate in the awards. For the BYLARA Basic Award (for those in Britain and Europe) you need to work 15 YL BYLARA members, to include at least 10 British YL members (G, GM, GW, GI, GD, GJ, GU plus the corresponding M- and 2- variants). For DX stations (those outside Europe), you need to work 10 YL BYLARA members, to include 6 British YL members.

For the Scottish BYLARA Award (for those in Britain and Europe) you need to work 6 GM (or MM, 2M) YLs, to include 2 GM BYLARA members. DX stations (those outside Europe) need to work 4 GM (or MM, 2M) YLs, to include 2 GM BYLARA members. No QSLs are necessary but you must include the BYLARA Membership Numbers of the stations worked. Contact awards manager Judith Brooks, G4IAQ to claim an award. See http://bylara.org.uk.

## NATIONAL CLUBS & ASSOCIATIONS

**Amateur Radio Caravan & Camping Club**
membership@arcc.org.uk www.arcc.org.uk
Caravan rally in July: Newstead Abbey, Notts (subject to confirmation).

**AMSAT-UK http://amsat-uk.org**
Open net every Sunday, 10am, ±3.780MHz

**British Amateur Radio Teledata Group**
Datacoms contests and awards
www.BARTG.org.uk

**British Railways ARS**
Membership@BRARS.info www.BRARS.info
Nets and magazine: see website.

**British Young Ladies Amateur Radio Association**
www.bylara.org.uk
Net Thursday, ±3.688MHz, 6.30pm.

**Civil Service Amateur Radio Society**
Weekly net every Tuesday, 8pm, 3.763MHz

**CDXC – The UK DX Foundation – cdxc.org.uk**
For all interested in HF DX and contesting

**Radio Amateur Old Timers' Association**
MemSec@RAOTA.org www.RAOTA.org
Nets: see website.

**UK Six Metre Group**
www.uksmg.org

**World Assoc of Christian Amateurs & Listeners**
Richard Paul, G7KMZ, G7KMZ@wacral.org
Various nets, see www.wacral.org

**Worked All Britain Awards Group**
www.worked-all-britain.org.uk
Nets most evenings, ±3.760MHz, time variable

The radio... YAESU

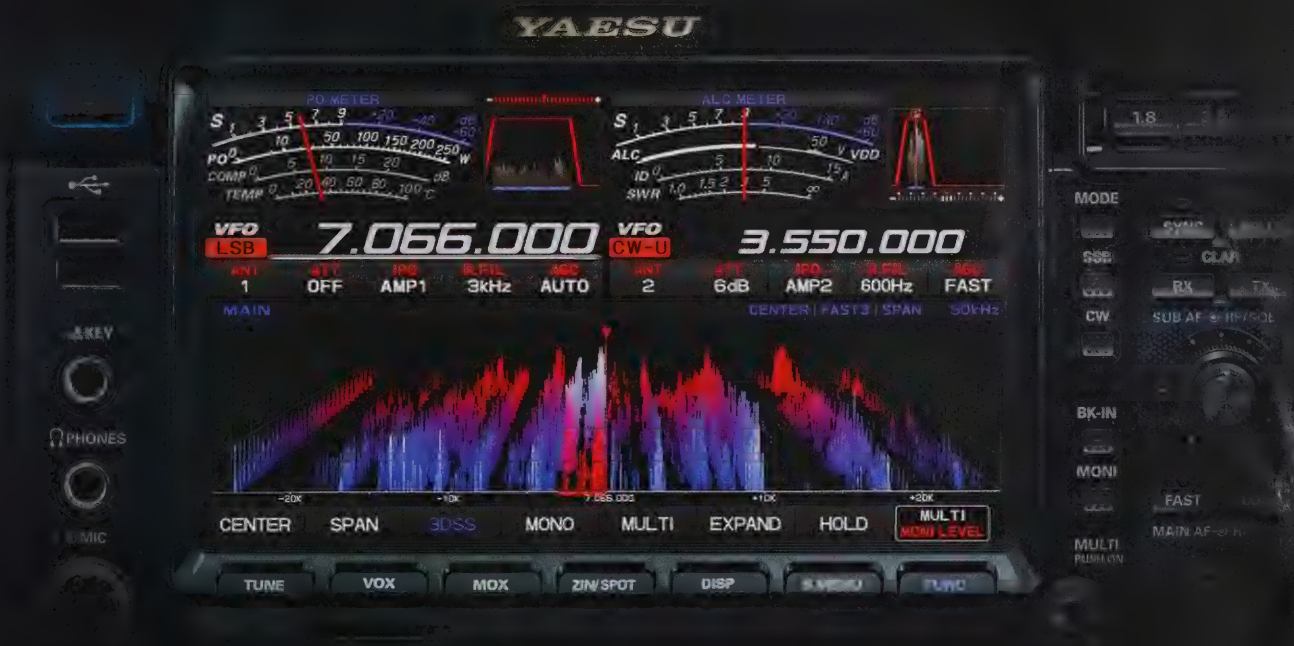
# FTDX101 TECHNICAL HIGHLIGHT - #4

## 3DSS (3-Dimensional Spectrum Stream)

***Displays the constantly changing band conditions in 3D***
***Instantly observe changes in the strength of the signals***

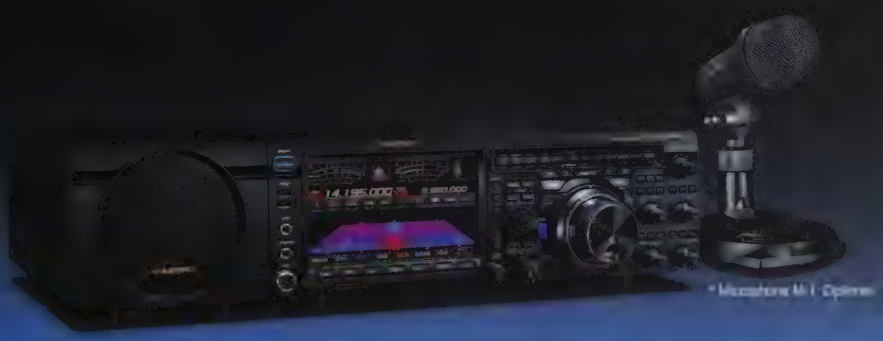
- *Display up to 25 seconds of previous band conditions in real time*
- *Simultaneously view output from both Narrow band SDR and Direct Sampling SDR on the display*
- *Versatile scope and multi-colour SDR display configuration enables clear and easy viewed presentation provided by 7" TFT Colour touch panel display*

3DSS
3D Spectrum Stream




HF/50MHz TRANSCEIVER
**FTDX101MP** 200W

HF/50MHz TRANSCEIVER
**FTDX101D** 100W




YAESU
The radio

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Specifications subject to change without notice. Some accessories and/or options may only be standard in some areas. Check with your local Yaesu Dealer for specific details.

# SPICE circuit simulation

## Introduction

A simulation program enables the performance of a circuit design to be assessed without first making a breadboard to show that it meets its specification or that it needs further development. Such programs can predict the time and frequency performance of a circuit, as well sensitivity to component tolerances. Simulations can be used to investigate 'what ifs', for example how a change in the value of one or more components affects the performance. It is also an educational tool and can form part of the 'self-training' aspect of our hobby.

A good simulation program is a 'laboratory in a box', where the 'box' is your computer. This laboratory is well equipped with a variety of instruments, such as power supplies, signal generators with sweep capabilities, function generators, an FFT-based spectrum analyser and voltage, current, phase and group delay measurement.

The circuit diagram is drawn on the screen using a mouse and keyboard and a simulation is run. Once the simulated circuit has been debugged, it can be constructed, or a PCB can be laid out, with confidence that it will work as intended.

The simulation program that I use is SPICE. It was first developed at UC Berkeley in the late 1960s. SPICE is open source and companies have added input and output routines to make commercial products. The best known of these is probably LTspice from Analog Devices [1] although the version that I use is from a UK company, SIMetrix [2]. A fully functioning version of this latter product is available as a free download and it is this version of SPICE that I will use here. It is limited to 140 nodes (component junctions) but this is seldom a problem.

## Using SPICE

Download SPICE and start a new schematic. There are two ways to place components on the screen, either by clicking on the components on the ribbon at the top of the screen or from the 'Place' tab. This latter method has more options. The components will have default values, for example resistors will be 1kΩ, capacitors will be 1nF, NPN transistors will be 2N2222 and so on. Double-clicking on the component will enable the value or part number to be changed. There are many semiconductor and other component models within the program and new ones can be added by the user. The circuit diagram can be annotated to record design information. Finally, an earth symbol must be added to indicate the reference rail (usually 0V); voltage measurements will be made relative to this rail.

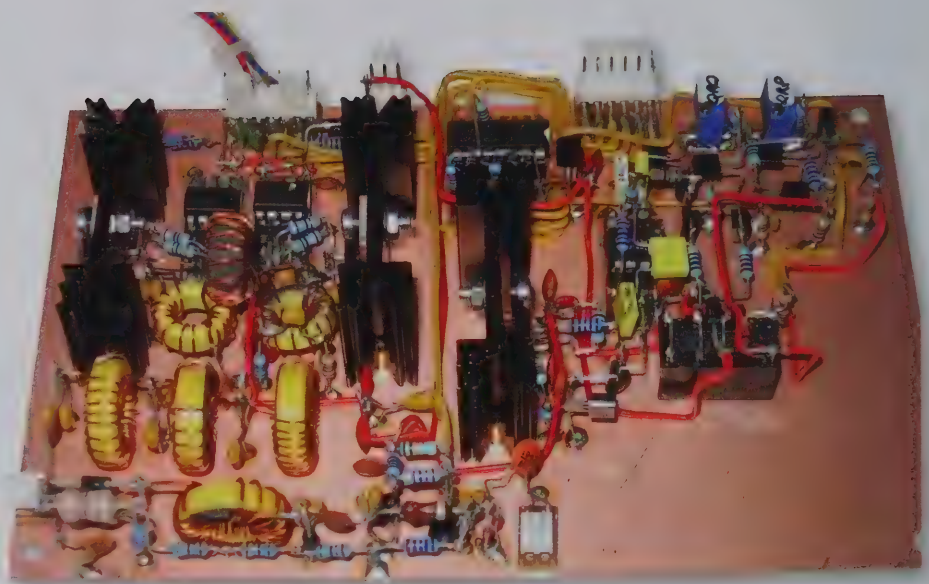

PHOTO 1: Push-pull Class E PA with waveform shaping.

There are reasons why a simulation might fail to run. There must be a resistive path from each node to 0V. A junction of two or more capacitors may not have such a path; the 'fix' is to add a very high value resistor between the junction and 0V. Two inductors connected together may cause a simulation to fail; a very small value resistor can be inserted between them. A current source may need a high value resistor connected across it (for example if connected in series with a capacitor) because otherwise it will have an infinite slope resistance, which SPICE interprets as an open circuit. If you forget to add the earth symbol, then the simulation will also fail.

After a simulation has been run, a probe is selected from the 'Probe' or 'Probe AC/Noise' tab. The mouse pointer takes on the appearance of a 'scope probe and this can be placed at the point to be measured and a left-click will either open a new graph window or will add the waveform to an existing window. If a differential measurement is to be made, then the probe

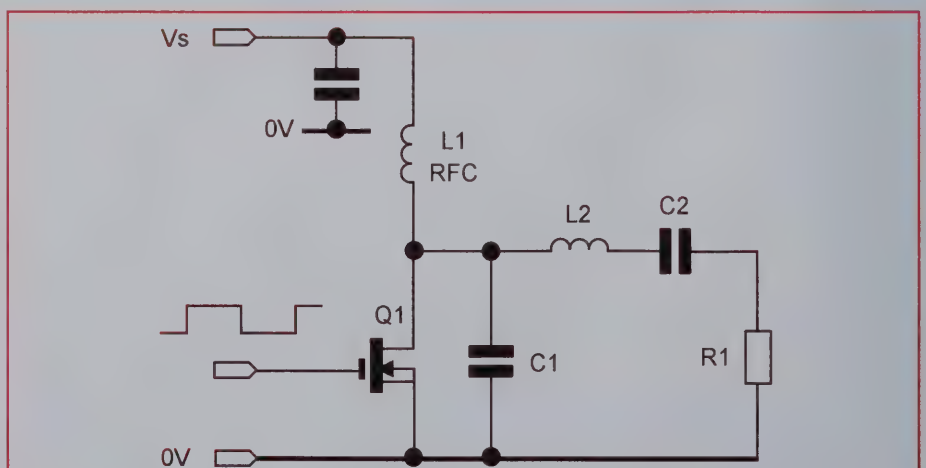


FIGURE 1: Basic Class E PA circuit.

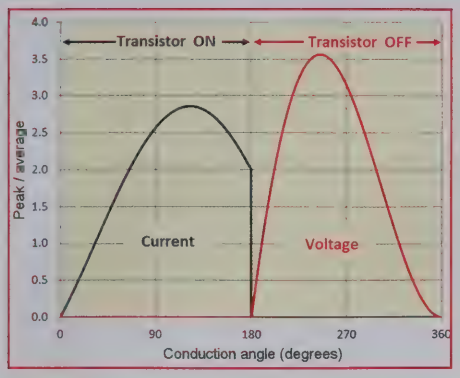


FIGURE 2: Idealised voltage and current waveforms for Class E switching PA.

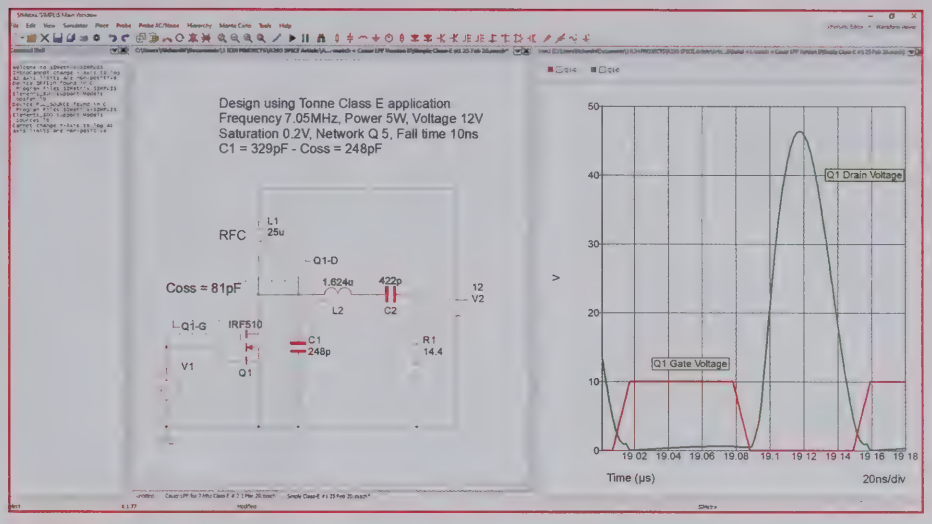


FIGURE 3: Basic Class E PA simulation and waveforms.

image must be left-clicked on each of the two measurement points in turn. Currents in wires can also be measured and displayed, as can spectra using the Fourier (FFT) resource.

## Transient response simulation

Using the transient response simulator of SPICE, we can examine waveforms as time progresses. The circuit stimulus is specified, for example a sine wave, square wave, pulse etc and the voltages and currents are calculated for a series of time increments and displayed graphically, rather like a digital oscilloscope. SPICE will make its best guess as to these time increments, or we can specify them. As an example, we will examine a Class E RF power amplifier because in its most basic form it uses few components and SPICE is an excellent tool for investigating this interesting circuit.

A Class E PA is a switching circuit that has a theoretical conversion efficiency of 100% (and in a practical circuit can achieve 85% or greater). Class E was popularised by Nathal Sokal, WA1HQC in his 2001 *QEX* article **[3]**, which includes the equations for calculating component values. These equations appear to have been used in a free application that can be downloaded from Tonne Software **[4]**. A detailed analysis of several other Class E configurations can be found in **[5]**. I have constructed several Class E PAs and I always start by investigating the circuit using SPICE. Only when I am satisfied that I understand the circuit and its operation do I build it and confirm the performance.

The basic Class E PA circuit is shown in **Figure 1**. Q1 is a MOSFET with the gate driven by a square wave of a voltage sufficient to saturate it. L1 is an RF choke with a high reactance that ensures that the current through it is almost constant.

Q1 is turned on and the drain voltage is forced to be near-zero. After half a cycle, Q1 is turned off and the drain voltage starts to rise due to the ringing caused by the inductances and capacitances. The voltage peaks at about 3.5 times the supply voltage and then starts to fall. Rather than undershooting, the component values are chosen so that the drain voltage falls to zero and it would then start to rise again except that Q1 is turned on again. These two features, the drain voltage falling to zero, at which point its slope is also zero, are defining characteristics of the Class E PA. Q1 never has both drain current and drain-source voltage at the same time and so has no dissipation. The idealised Q1 drain current and voltage waveforms are shown in **Figure 2**.

The circuit diagram is entered on the screen (**Figure 3**) and the stimulus and analysis modes are set up – in the following example the sample period is 1ns. The rise and fall times of the gate drive waveform have been set to 10ns, a figure that might reasonably be achieved in practice. The simulation should be run for a period equivalent to a hundred or more cycles so that the output has time to stabilise. The waveforms can be examined towards the end of this time. I have added probe points to the gate and drain of Q1. After the program has been run, a graphical display window will open and display both waveforms. In this simulation, the drain waveform doesn't quite reach zero and the energy stored in C1 is dissipated in Q1 when it turns on – but this is negligible.

If the simulation is run for at least 50µs, with the data output starting at 10µs (so that the operation has had time to stabilise), then the spectrum can be measured using the Fourier facility of SPICE and this is shown in **Figure 4**. The second harmonic is only -18dBc and additional filtering will be required to meet my target, -50dBc (based on CEPT/ERC/Recommendation 74-01E for the Amateur Radio Service).

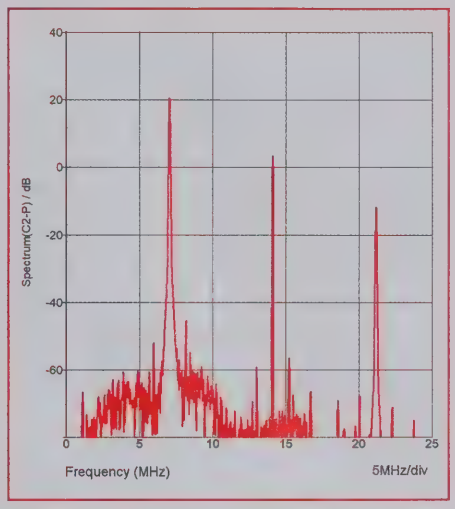


FIGURE 4: Fourier spectrum of basic Class E PA.

## Swept frequency response simulation

There are many low pass filters that we could use. The terminating resistance will be 50Ω. I used ELSIE **[6]** to examine a variety of filter types before settling on a five pole Cauer low pass filter. I adjusted the specification by trial and error so that the filter had notches at the second and third harmonics.

I entered this filter into SPICE and from the 'Simulator' tab I selected 'Choose Analysis' and from that menu the 'AC' simulator and analysis modes. I set a logarithmic frequency sweep from 1MHz to 100MHz with 1000 steps/decade and used the virtual scope probe from the 'Probe AC/Noise' tab to display the insertion loss of the filter. The filter and insertion loss are shown in **Figure 5**.

**Richard Harris, G3OTK**
g3otk@yahoo.com

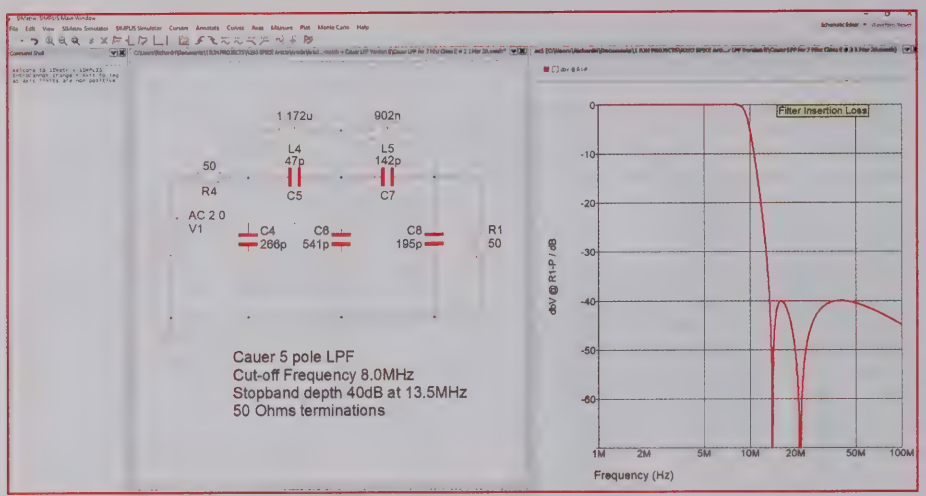


FIGURE 5: Five pole Cauer filter.

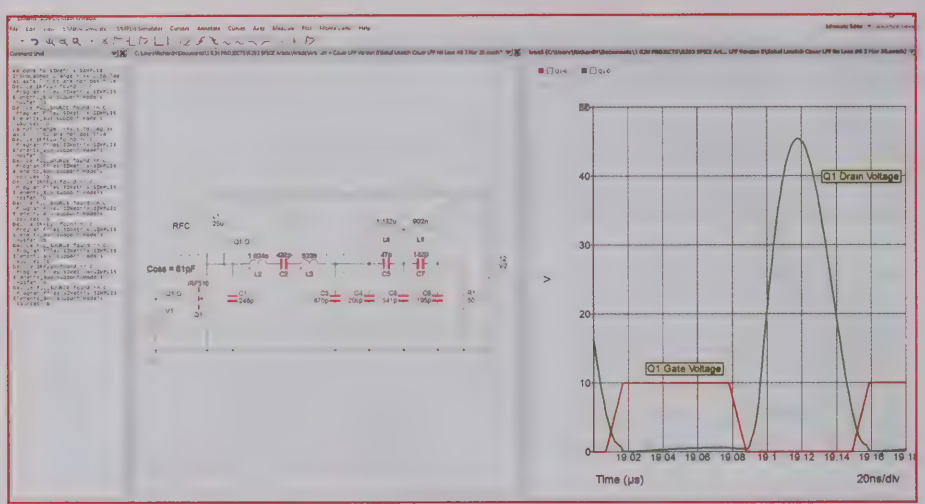


FIGURE 6: Class E PA with L-match and filter.

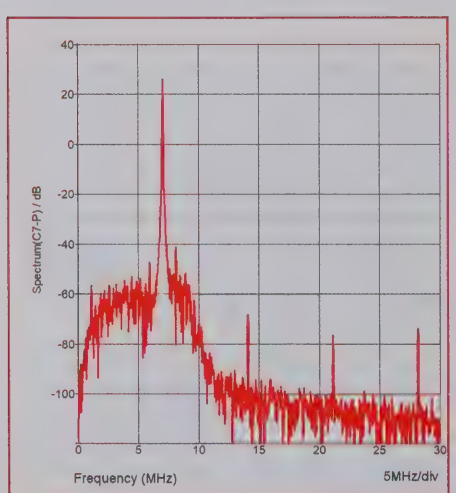


FIGURE 7: Spectrum of PA and filter.

ELSIE can also display the input impedance of the filter. At the design frequency of 7.05MHz, the input is equivalent to 53Ω resistor in parallel with a 27pF capacitor. The Class E PA in Figure 3 requires a resistive load of 14.4Ω and so we must use a matching section. An L-match is a simple solution. A series inductor of 0.532µH and a shunt capacitor of 697pF will match a resistive 14.4Ω to a resistive 53Ω and we can compensate for the input capacitance of the filter by reducing the shunt capacitor by 27pF to 670pF. We can combine all of these elements into a single circuit and simulate the performance, as shown in **Figure 6**.

The drain waveform of Q1 is very similar to that of the basic Class-E circuit in Figure 3. The drain voltage falls to about 1V when Q1 turns on and doesn't quite reach a zero slope. The circuit can be simplified by merging L2 and L3 into a single inductor and merging C3 and C4 into a single capacitor.

The predicted Fourier spectrum is shown in **Figure 7**. This shows that the 2nd, 3rd and 4th harmonics are all about -90dBc, a very satisfactory result. A power output of 5W is the design aim and SPICE predicts 5.06W. We have not taken the losses in the components into account (other than in the SPICE model for Q1). Resistors representing component losses can be added to the simulation.

The RF choke can be wound onto a ferrite toroid core (type 61 ferrite material has a Q of about 100 at 7MHz) and the other inductors wound on type 6 iron dust cores that have a Q of about 200. The impedance of the RF choke (25µH used in the simulation) is high and SPICE predicts that the current through it only varies by about ±5% over a cycle; consequently, the RF losses in choke are low.

**Photo 1** shows an 80m CW transceiver PA board that I developed using SPICE. On the left side of the board is the push-pull Class-E PA, which is switchable to 10 or 40W. To the right is the keyed RF waveform shaping circuits that give leading and trailing edges approximating a raised cosine. I use wire ended components and build 'Manhattan' style. This is the final version, not a breadboard!

## Using the data file

When one of more points of the circuit is probed, a graphical window is opened. The data file for the graph can be copied and pasted into a spreadsheet. Many instruments, for example digital oscilloscopes and VNAs, generate files of measured data that can be imported into a spreadsheet and so the simulation and measured results can be compared.

If I want to measure the input impedance of, say, a simulated filter, then I run a frequency sweep using a 1A constant current source and probe the voltage at the input of the filter. The impedance will be numerically the same as the voltage. The real and imaginary components of the voltage (and hence the resistive and reactive components of the impedance) are together is the same cells and the string handling functions of the spreadsheet can be used to separate them.

## Conclusion

A circuit simulator such as SPICE is a powerful tool for verifying a circuit design. Although I have only simulated discrete component circuits, SPICE has models for a wide range of opamps and also has limited simulation capabilities for digital circuits. Simulators are a great aid to learning about circuit design and performance.

### Websearch

[1] https://tinyurl.com/RC0720-SPICE-1
[2] https://tinyurl.com/RC0720-SPICE-2
[3] Class-E RF Power Amplifiers, Nathan Sokal, WA1HQC, *QEX* January-February 2001 pp 9 – 20, https://tinyurl.com/RC0720-SPICE-3
[4] http://tonnesoftware.com/classe.html
[5] Switchmode RF and Microwave Amplifiers, A Grebennikov, N O Sokal, M J Franco, Academic Press, ISBN 9780124159075. A PDF copy may be found at Researchgate.net.
[6] http://tonnesoftware.com/elsiedownload.html

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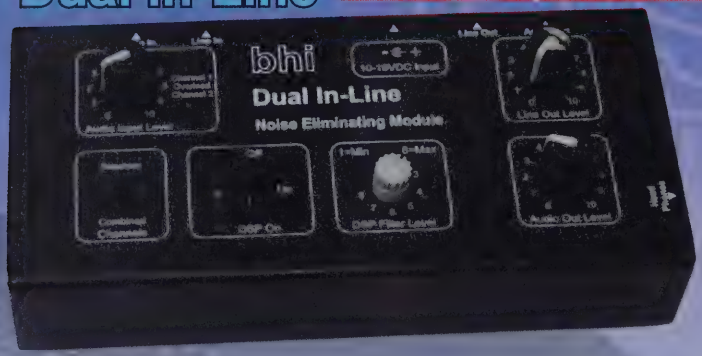


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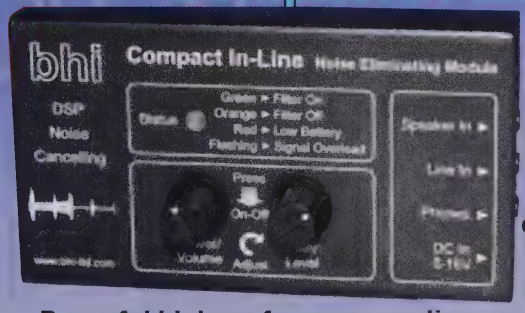


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# Contesting

**Changes to contesting calendars and rules due to the coronavirus pandemic continue. Details here were correct in early June when the column was prepared.**

If you are planning to take part in any event away from your home, please check the relevant website before you do so and check the current government guidance in place at the time.

## GR2HQ

The IARU HF Championship runs for 24 hours over the weekend 11-12th. During the normal scheme of things, GR2HQ activity would see several teams of contesters gathering to operate on SSB and CW from well-equipped shacks all around the UK, but because these are not normal times, activity will be by single operator stations only this year. That's not to say that any individual operator will be active for the full 24 hours, because activity will be coordinated and switched around.

The 2020 80m Club Championship series draws to a close this month, with the CW leg on Monday 6th and the SSB leg on Wednesday 15th. The Low Power Contest – the only RSGB contest with a lunch break – is on Sunday 19th. The very last 80m Club Champs session this year is datamodes, on Thursday 23rd. RSGB's Flagship HF contest – IOTA – takes place over the weekend of 25-26th. Exchange a signal report, serial number and your IOTA reference. Mainland Britain is EU-005, mainland Ireland is EU-115, while smaller islands have differing references. A full list can be found at www.qrz.com/i/iota.html. The Low Power and IOTA contests have been scaled back this year, with no portable entries being accepted. The new FT4 Series continues on Monday 27th.

Over the first weekend of the month, VHF NFD and the 2m Backpackers contest are not happening in their usual format this year. At the time of writing it wasn't clear what was going to be possible, but there will be publicity on the internet by the time this edition of *RadCom* is received. All other events remain, although entry restrictions still apply. The first VHF Activity Contests of the month are the 2m FMAC and UKAC on Tuesday 7th. The 6m UKAC is on Thursday 9th. In the week that follows the 70cm FMAC and UKAC are on Tuesday 14th, followed by the 4m UKAC on Thursday 16th. The 70MHz Trophy contest is on Sunday 19th. Then it's back to the Activity Contests, with 23cm on Tuesday 21st and SHF on Tuesday 28th.

The UK Six Metre Group's Summer Marathon started in early May and continues until early August. There are no set operating times; just try to work every Locator square you can. The IARU HF Championship takes place over the weekend of 11-12th. Exchange a signal report and ITU Zone. Finally, the UK Microwave Group has a High Band contest on Sunday 26th.

## Hope QSO Party

With the Covid-19 lockdown, the HF Contest Committee's decision to run a 6-week series of Hope QSO Parties (HQP) and later a second series both came too late to be included in this column. Apologies for that. With a total of over 500 stations entering Series 1 alone (not all in each session), the HQP was a real success. In part this must be because they were open for everyone to enter, but I thought they were cleverly conceived. The way that HF propagation changes throughout the day meant that the right tactics to build a big score in a Monday session didn't work well in subsequent sessions of the same week, because they took place ever later in the day.

Steve White, G3ZVW
steve.g3zvw@gmail.com

### RSGB HF Events

| Date | Event | Times (UTC) | Mode(s) | Band(s) | Exchange |
|---|---|---|---|---|---|
| Mon 6 Jul | 80m Club Championships | 1900-2030 | CW | 3.5 | RST + SN |
| Wed 15 Jul | 80m Club Championships | 1900-2030 | SSB | 3.5 | RS + SN |
| Sun 19 Jul | Low Power Contest * | 0900-1600 | CW | 3.5-14 | RST + SN + power – see text |
| Thu 23 Jul | 80m Club Championships | 1900-2030 | Data | 3.5 | RST + SN |
| Sat-Sun 25-26 Jul | Islands on the Air | 1200-1200 | CW/SSB | 3.5-28 | RST + SN + IOTA ref – see text |
| Mon 27 Jul | Monday FT4 Series #6 | 1900-2030 | FT4 | 3.5 | 4-character Locator |

### RSGB VHF Events

| Date | Event | Times (UTC) | Mode(s) | Band(s) | Exchange |
|---|---|---|---|---|---|
| Sat-Sun 4-5 Jul | VHF NFD | 1400-1400 | All | 50-1.3G | RS(T) + SN + Locator – see text |
| Sun 5 Jul | 3rd 2m Backpackers | 1100-1500 | All | 144 | RS(T) + SN + Locator – see text |
| Tue 7 Jul | 144MHz FMAC | 1800-1855 | FM | 144 | RS + SN + Locator |
| Tue 7 Jul | 144MHz UKAC | 1900-2130 | All | 144 | RS(T) + SN + Locator |
| Thu 9 Jul | 50MHz UKAC | 1900-2130 | All | 50 | RS(T) + SN + Locator |
| Tue 14 Jul | 432MHz FMAC | 1800-1855 | FM | 432 | RS + SN + Locator |
| Tue 14 Jul | 432MHz UKAC | 1900-2130 | All | 432 | RS(T) + SN + Locator |
| Thu 16 Jul | 70MHz UKAC | 1900-2130 | All | 70 | RS(T) + SN + Locator |
| Sun 19 Jul | 70MHz Trophy + | 1000-1600 | All | 70 | RS(T) + SN + Locator + Postcode |
| Tue 21 Jul | 1.3GHz UKAC | 1900-2130 | All | 1.3G | RS(T) + SN + Locator |
| Tue 28 Jul | SHF UKAC | 1830-2200 | All | 2.3G & up | RS(T) + SN + Locator |

### Best of the Rest Events

| Date | Event | Times (UTC) | Mode(s) | Band(s) | Exchange (info) |
|---|---|---|---|---|---|
| Sat 2 May - Sun 2 Aug | UKSMG Summer Marathon | All | All | 50 | 4-character Locator |
| Sat-Sun 11-12 Jul | IARU HF Championship | 1200-1200 | CW, SSB | 1.8-28 | RS(T) + ITU zone (UK=27) |
| Sun 26 Jul | UKuG | 0600-1800 | All | 5.7, 10G | RS(T) + SN + Locator |

* HF Championship event. + VHF Championship event. For all the latest RSGB contest information and results, visit www.rsgbcc.org

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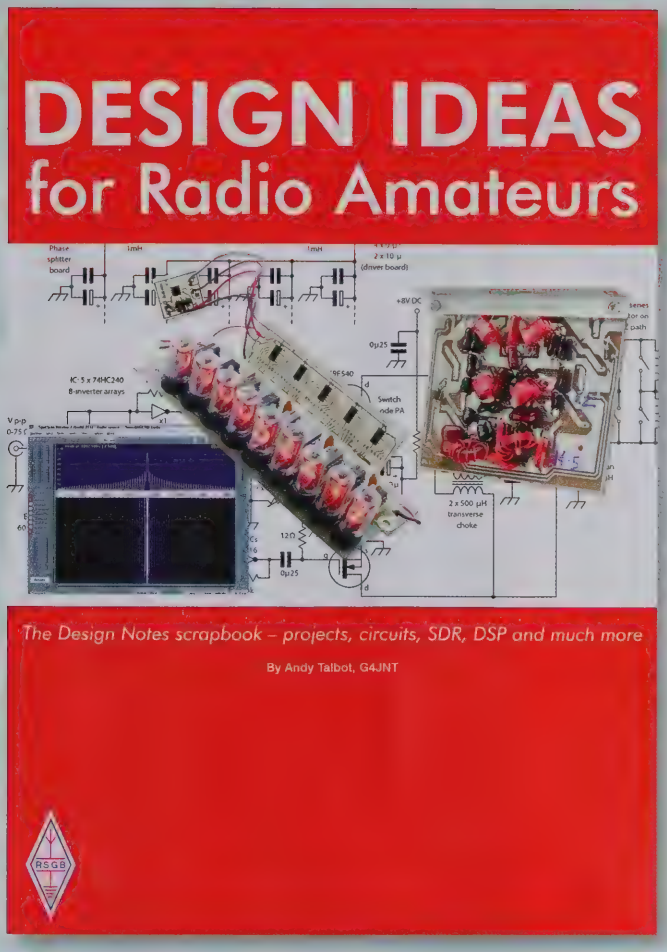
DESIGN IDEAS
for Radio Amateurs
The Design Notes scrapbook – projects, circuits, SDR, DSP and much more
By Andy Talbot, G4JNT
RSGB

# DESIGN IDEAS for Radio Amateurs

*The Design Notes scrapbook – projects, circuits, SDR, DSP and much more*

By Andy Talbot, G4JNT

Since it was first published over ten years ago, the *Design Notes* column in The Radio Society of Great Britain (RSGB) Journal *RadCom* has been a favourite amongst the Members of the Society. Each month Andy Talbot, G4JNT has covered a huge variety of topics in his inimitable, interesting style. Presented here in a scrapbook style is the entire collection of first ten years of Andy's *Design Notes* column.

*Design Ideas for Radio Amateurs* shows that the *RadCom* column has always been at the forefront of amateur radio technologies and techniques. Andy has demonstrated the breadth, depth and versatility of his knowledge and experience – all in an eminently readable style. He has been a champion of surface mount technology and you will find countless examples of how practical it is to make your own one-off PCBs for surface mount circuits. Andy often shows how to make use of surplus kit in interesting ways so you can make-your-own this and that. The scope is very wide covering from VLF (Andy was an LF pioneer) up to the high microwave bands (he's the keeper of a microwave beacon cluster), and everything in between. Readers will find Andy has encompassed analogue, digital, voice, image and much more.

The *Design Notes* column has proved a fascinating read in relatively small, monthly doses over the past decade. When these works are gathered together, as they are in *Design Ideas for Radio Amateurs,* they become a source of inspiration, with an array of – projects, circuits, SDR, DSP and much more. If you want new amateur radio ideas, this book comes as highly recommended reading.

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# EncoderCAT – CAT control by rotary encoders

## Introduction

Today's transceivers have a wide range of parameters that can be adjusted to suit your requirements, but the controls are frequently buried in the menu structure. Computer CAT software often controls such parameters using on-screen slider controls operated by a mouse, but physical rotary controls are generally much easier to use, particularly if the item to be controlled is 'buried'.

EncoderCAT is a home construction project that provides standalone CAT control of a radio using eight rotary encoders. Each encoder is configured to control one radio CAT parameter. An Atmel Atxmega192A3 microprocessor performs the interfacing; it has a small OLED display panel that identifies the operated encoder and shows the current setting. I originally developed it for my newly purchased Yaesu FTDX101D. Icom CI-V support was then added, using my Icom IC-7000 as the testbed.

Taking as the example the FTDX101D, the most commonly-adjusted parameters are controlled by dedicated knobs. In addition, a single 'Multifunction' control can be assigned to one of a range of other rig parameters. These include DNR level and RF Power, for which separate controls are desirable. (This need was noted by Peter Hart in his review in the October 2019 *RadCom*.)

EncoderCAT uses eight low cost electro-mechanical rotary encoders, of the type commonly used as volume controls in car radios. They have remained available for purchase on eBay for the past 15 years or longer. The cost can be as low as £20 for ten. There is also an I²C-connected 32x128 pixel small OLED display panel that shows the identity of the last operated encoder and its CAT value.

Most PC CAT software has built in command data for a wide range of different radios. EncoderCAT doesn't have this. We only need to configure it for eight encoders.

The microprocessor's 2kbyte flash memory is adequate to hold the configuration data. This configuration dataset contains a text descriptor, CAT control and OLED display information for each encoder. It also contains baud rate and other serial interface settings and a dataset title. The dataset is generated and edited by the PC based xCAT application, which communicates with the EncoderCAT module via USB. (You'll need to install xCAT by running xcatsetup.exe). A dataset can be copied to and from EncoderCAT and to and from a text .ini file. EncoderCAT only needs to be programmed via USB once; it retains the data in its flash memory. However, you can chose to re-program it at any time, in order to change the encoder settings or to use it with a different radio.

PHOTO 1: General view of a completed prototype.

EncoderCAT provides two configuration interfaces:

- For Yaesu, Kenwood and Elekaft radios that use ASCII text CAT commands via RS232 serial interfaces, the EncoderCAT PCB has a 9 pin RS232 connector.
- For Icom radios that communicate using hexadecimal and binary-coded-decimal byte sequences, the EncoderCAT PCB has an Icom CI-V connector (3.5mm mono jack).

## Project organisation

EncoderCAT is supported by a website [1]. The whole website content is downloadable (from the website) as a 40+ page printable PDF document. This can also be found on the RSGB website in the *RadCom* downloads section [2]. The website has detailed information on construction and operation and extensive instructions on configuration for different radios.

Downloadable files include the full circuit diagram, a parts list with suggested suppliers, PCB information, source code for the Atxmega192A3 processor firmware and the xCAT PC-based configuration program.

Xcatsetup.exe is an installer /updater script that installs xCAT on your PC and places the source code, compiled EncoderCAT processor hex code and other relevant files on your PC.

If required, I can also supply a pre-programmed Atxmega192A3 processor to save you the cost of an Atmel JTAG programmer. However, this project is likely to develop with user feedback and you would need a programmer to take advantage of updates. There is an EncoderCAT user's group [3] that I recommend you join if you're thinking about making this project.

I have had PCBs professionally made by a Chinese PCB house and can make them available for £5 including postage. It is not

PHOTO 2: Inside the EncoderCAT box showing PCB, rotary encoders and wiring.

practical to make the board as-designed at home, as it would require links beneath the SMD-packaged processor.

## General description

**Photo 1** shows the completed prototype and **Photo 2** shows the inside of the box. The eight rotary encoders are at the top of the image. The block diagram, **Figure 1**, shows the main functional areas and this can be viewed in conjunction with **Photo 3**. The key to everything is the ATxmega processor, U1. This interfaces directly to the eight rotary encoders, checking for any rotation (and the direction of that rotation) and to the OLED display panel under control of the operating program. Processor internal (flash) memory stores the various configuration data and variables. Communication with the outside world includes an RS232 port (via driver U5), an I²C port for the display, a serial port to communicate with a future Raspberry Pi web server, plus a USB port that's used for data transfer and power. Finally, the JTAG programming port provides the means to program the ATxmega processor – more on that later.

Normal operation uses only two external cables: micro USB for power and a cable to the radio. The RS232 connector is a standard 9-pin D; the Icom CI-V connector is a 3.5mm mono jack socket. These are all located at the board edge. The micro USB is also used for configuration by xCAT on the PC. I therefore power EncoderCAT from a PC USB port.

The PCB has other connectors, including two 10 way Molex for the encoders, a 4-way I²C and +3.3V connector for the OLED display and a 5x2 IDC JTAG programming connector.

Jumpers switch between power supply options (USB or other) and between RS232 and Icom CI-V.

The PCB has provision for a 4Mbit flash memory device, which is shown on the diagram as U6. It is not used (or required) in this application, however it adds flexibility to the board if used in different, unrelated applications.

## Construction

Detailed constructional information is contained in the downloadable information, including two pages of advice on soldering the SMD components. Particular attention is given to the tiny 16MHz crystal and the USB power choke, as these are the trickiest to solder. The 64 pin microprocessor is relatively easy to deal with as the pin spacing is relatively large by modern comparisons at 0.8mm pitch.

The advice includes suggesting using rework solder spray flux. When partly dried this flux achieves a sticky, syrupy consistency, ideal for holding an SMD device in position for soldering. The device can be slowly pushed through the sticky flux into a precise position whilst observing though a good magnifying glass. The need for a good desoldering wick to clear solder bridges is also mentioned.

I make all my radio equipment boxes from 1.6mm double sided PCB material, as it produces a strong result and complex three dimensional shapes are easily achieved. It is easy to drill and file. Brass mounting pillars and screws and ground connection can be soldered directly to it. However, there are no particular layout or enclosure requirements: you can adjust the arrangements, materials and so forth to suit your particular requirements.

## Rotary encoders

EncoderCAT uses low cost, 3-terminal encoders. A recent search on eBay for 'rotary encoder' found some 2,500 listings, so there is no shortage of choice. The type needed here are the simple electro-mechanical controls with (typically) 24 clicks per revolution. Suitable encoders are often just £5 for ten.

The encoders have a common connection, which is grounded. The other two connections I refer to as phase and quad outputs. In the resting state (between clicks), phase and quad are open circuit. When the encoder is rotated in either direction, phase is grounded and triggers a processor interrupt. The processor responds with an interrupt service routine that examines the eight phase inputs (processor PORT A) to identify the encoder and then reads the state of the corresponding quad line in order to determine UP or DOWN movement. With my encoders, quad remains high (3V3) on clockwise rotation and is pulled low for anticlockwise. Swapping quad and phase will reverse an incorrect directional response.

The processor accesses the CAT configuration info for the triggered encoder and its associated CAT radio parameter, increasing or decrementing the value as appropriate.

**Ian Sumner, G3VPX**
ian@g3vpx.net

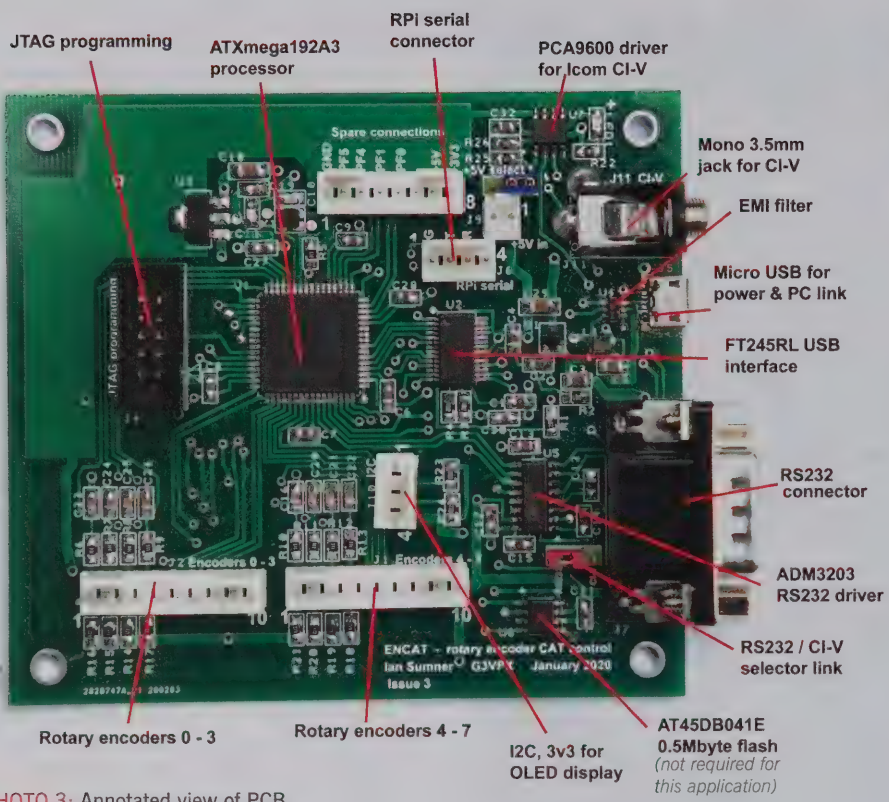
JTAG programming
ATXmega192A3 processor
RPi serial connector
PCA9600 driver for Icom CI-V
Mono 3.5mm jack for CI-V
EMI filter
Micro USB for power & PC link
FT245RL USB interface
RS232 connector
ADM3203 RS232 driver
RS232 / CI-V selector link
AT45DB041E 0.5Mbyte flash (not required for this application)
I2C, 3v3 for OLED display
Rotary encoders 4 - 7
Rotary encoders 0 - 3

PHOTO 3: Annotated view of PCB.

PHOTO 4: Typical display on OLED panel.

## Read – modify – write

A fundamental issue is that between encoder actions, EncoderCAT cannot hold information on the current level of the associated parameter. Rotary encoder controls, by their very nature, do not specify an absolute level. They change the current level. For that reason, a majority of EncoderCAT settings actually work on a read – modify – write sequences as follows:

- send a CAT message to read the current level of the CAT parameter
- (radio returns the level data)
- increment or decrement the level as specified by direction of encoder rotation (and by an amount-per-step that is set in the configuration)
- send the modified level back to the radio
- (Icom CI-V only) – radio sends a final OK message back
- update OLED display with the identity of the encoder parameter and its new level setting.

Appropriate step sizes can be configured. For example, where RF power is adjustable from 0-100W, I set the step size to 5W. Elsewhere, the default step size of 1 might be more appropriate, for example a volume control range of 1-100.

Icom CI_V configuration has five or so different command formats. Most parameters require EncoderCAT to use read – modify – write commands, though there are also several 'send-only' commands. My CI-V configuration system supports some of these.

With send-only commands, encoder rotation can only have a simple binary effect, eg turn left/right = off/on or perhaps A/B or even RF power 25% / 100%.

## OLED display

The small OLED display (**Photo 4**) module has 32 x 128 pixels. The interface is I²C and the software supports the SSD1306 driver specification. The typical cost is around £4. There are four connections: SDL and SDA (the I²C bus), GND and +3.3V.

Unlike the older 16x2 and similar LCDs, these OLED units have no built-in fonts. EncoderCAT contains two proportionally spaced fonts – a small (8 pixel high) version for identifying functions and a large (16 pixel high) font for displaying the varied parameter and its units. Both can be seen in Photo 4.

For each encoder, there are five fields that control the display format:

- **mult** and **div**, to allow scaling, eg mult = 100 and div = 255 displays 0-255 as 0-100.
- **decp** allows a decimal point to be inserted, eg decp = 3 displays 3215 as 3.215
- **units**, up to 6 characters displayed after the value, eg 3.215 kHz
- **lookup**, an option for the CAT value to be used as the index for a lookup table (of up to 54 entries), for example when setting filter bandwidths, 0 may map to 300Hz, 1 to 600Hz, 2 to 1000Hz etc.

## USB interface

The USB connection to a PC uses the FTDI FT245RL USB FIFO (U2). This is programmed to identify the unit as 'encat' within its identifier string. Its main function is to provide a 'proper' USB interface to the processor that can be recognised by the PC. (There is a lot of information on programming the FT245RL, installing drivers and so on as part of the information downloadable from the website [1]).

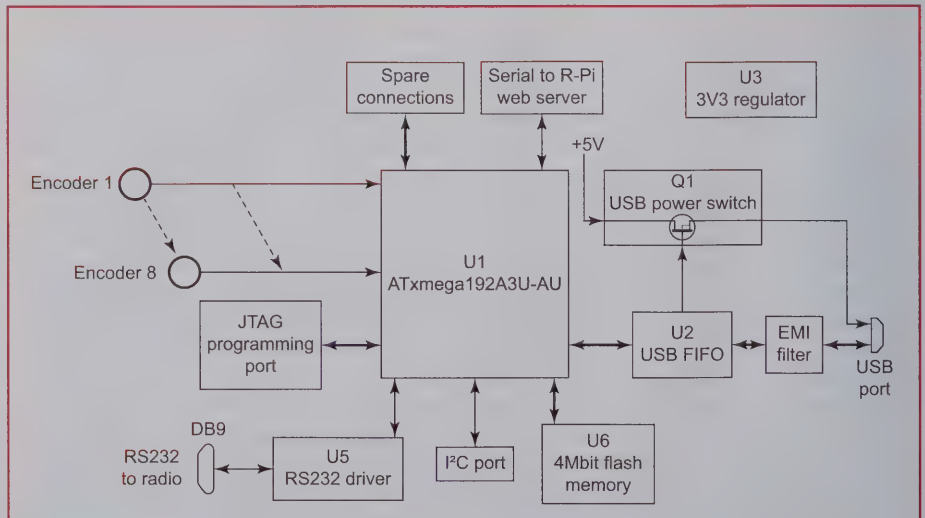


FIGURE 1: Block diagram of the system. The flash memory U6 is not fitted or needed (see text).

## Software

Atmel microprocessors are programmed in the language C. The C source code for EncoderCAT is downloadable from the website. This can be edited and compiled in Amtel's development package, Studio 7, which is a free download. This builds the compiled code into encat.hex, which is then programmed into the processor program memory. The design allows flexible encoder configuration for different radios without any change to the firmware source code. However, the source code is provided for the more enthusiastic to play with.

Transferring the enact.hex into the ATxmega processor is potentially the most expensive part of the project. It requires an AMTEL-ICE JTAG (Joint Test Action Group) programmer. (Note that Atmel are now part of Microchip and so the download is from Microchip.) I have attempted to minimise the expense by buying the lowest cost option, an Atmel ATAMEL-ICE-PCBA. This is a PCB-only version of the programmer and currently (May 2020) costs £39.39 + VAT from Farnell. To buy this with a set of cables (most of which you don't need!) doubles the price. My website [1] shows how to make a cable. The only difficult item is a short length of 10 way 0.0635mm IDC cable, which I have found in the UK only to be available in 30m reels. I bought a reel, and will supply a suitable length free with the PCB if requested.

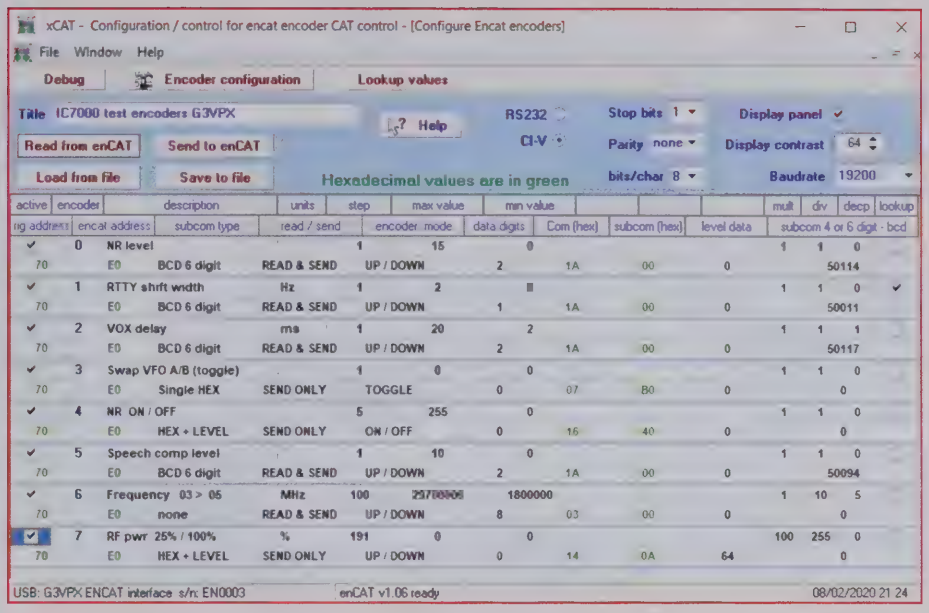


FIGURE 2: Part of the setup procedure for an Icom IC-7000 radio. Settings can be saved to, and loaded from, the EncoderCAT processor, and saved and loaded to files on the PC.

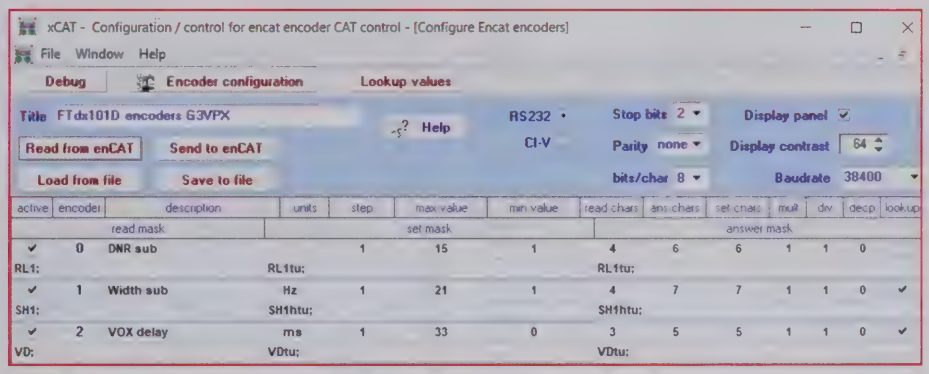


FIGURE 3: Part of the setup procedure for a Yaesu FTDX101D, setting encoder actions.

## Configuration system

As mentioned earlier, EncoderCAT is not pre-configured for any particular radio, although sample files are provided for the FTDX101D and IC-7000.

I had to come up with a dataset format by which the user could configure each encoder, using the CAT manual for his/her radio. The EncoderCAT firmware then interprets the dataset in performing a read – modify – write sequence on the radio. There are two datasets: one for ASCII text RS232 systems such as Yaesu and Kenwood, and one for Icom CI-V. They share in common:

- encoder fields: active, encoder no, description, step, min value and max value
- OLED display fields: units, mult, div, decp and a lookup table.

However, the fields controlling CAT data transmission are very different.

Full details of how to prepare configurations for different radio types are included in the downloadable information. **Figure 2** shows part of the setup for an Icom IC-7000; similar screens are used when setting up other radios. Very broadly speaking, the process is somewhat like setting up transceiver memories in a spreadsheet-like environment. I hope and expect users will share their different setups via the groups.io forum.

## Future expansion plans

The eagle-eyed will have noticed that the block diagram includes a reference to a Raspberry Pi web server. This facility is presently under development and will allow full remote control of your radio over a network (or the internet). I hope this will be the subject of a future article.

The great thing about having a re-programmable microprocessor as the heart of a system like this is that if you build in a degree of hardware flexibility from the outset, it's relatively easy to add new features – even ones that you hadn't thought about in the initial design, hence the 'spare connections'!

## Conclusion

For reasons of space it has only been possible here to give an outline of the EncoderCAT hardware and software, but you'll find a great deal more info on the website [1], including a downloadable PDF file of around 40 pages that covers the project in much greater detail. In particular, it contains a lot more information on the JTAG programmer modifications and much more detail on how to prepare the configuration files and download them to the EncoderCAT processor.

EncoderCAT is working well on my two radios. There may be teething troubles with other radios but I'm sure we'll be able to get things sorted out via the online user group. Meanwhile, please email me via ian@g3CPX.net if you want to obtain a PCB – or ask questions about the project.

Websearch

[1] www.encat.g3vpx.net
[2] https://rsgb.org/main/publications-archives/radcom/supplementary-information/
[3] https://groups.io/g/encodercat

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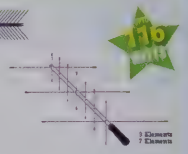


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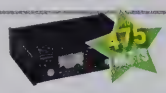


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# Design Notes

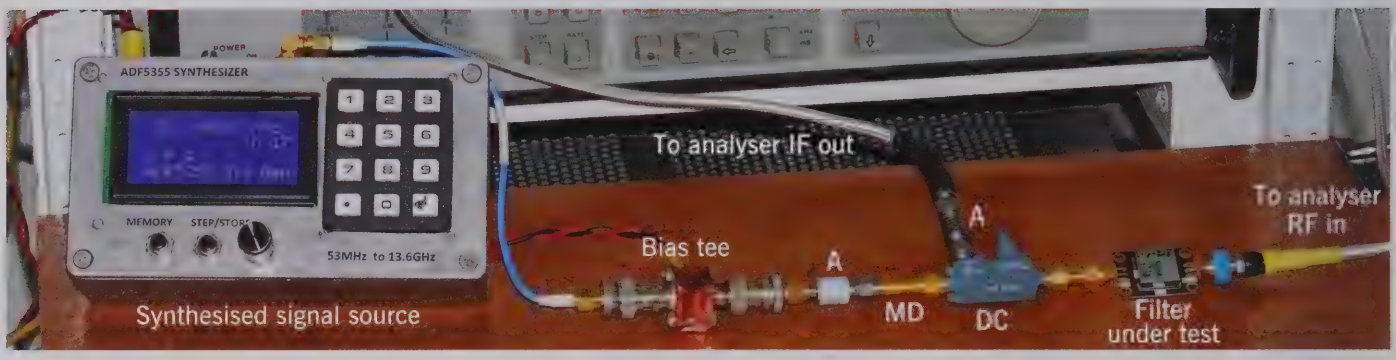


PHOTO 1: Breadboard tracking generator based around a harmonic mixer and IF frequency source. Used in conjunction with a spectrum analyser to measure the frequency response of the filter unit shown. KEY: A – attenuator. MD – mixer diode. DC – directional coupler. The flying coax from the directional coupler goes to the spectrum analyser 1st LO output; the lead on the right from the filter goes to the spectrum analyser RF input. The analyser's screen showed the response shown in Figure 2.

## Tracking generator

There is one item of test equipment that tends to get overlooked nowadays, but is still useful if you have a wide range spectrum analyser: the tracking generator. This is a box that is used in conjunction with a spectrum analyser to generate an RF signal that is always exactly equal to the instantaneous frequency the spectrum analyser is looking at, whatever frequency range or sweep settings may be in use. If the output of the tracking generator is then connected to the input of the analyser the display will, ideally, show as a trace of constant amplitude; a (nominally) flat line with a 'significant' amplitude.

Last time we looked at the internals of a spectrum analyser front end, showing how a sweep generator, harmonic mixer and a tuned narrowband YIG filter are used together to look at a wide band of frequencies using signal detection and measurement on the IF output from the mixer. This is shown diagrammatically in the upper half of **Figure 1**. The various components were described in detail last time. To make a tracking generator we take the same harmonic mixer arrangement and run it backwards, feeding a sample of the LO taken from the spectrum analyser into the directional coupler port. The IF port of the mixer is supplied with an independently generated carrier at the same intermediate frequency (IF) as that used in the spectrum analyser. The lower half of Figure 1 shows the arrangement in detail. The output from the harmonic mixer consists of a whole mix of products of N x LO ± IF, one of which will always be at the exact point in the sweep the analyser is looking at. The YIG filter ensures only the wanted mixer product is tracked.

So what is the point of all this if the only result is a flat(tish) trace on the screen? We now insert a device whose frequency response we want to measure, such as a filter, between the output of the tracking generator and the spectrum analyser. The height of the trace now follows the response of the filter and we can use the combination to set up and adjust the filter in real time, with the frequency response appearing on the spectrum analyser display screen. The spectrum analyser has considerable flexibility with regard to frequency coverage and span, more so than most other items of test equipment amateurs are likely to own, so a tracking generator is useful to have as an adjunct. These days network analysers are quite popular and certainly cheap enough to do a much better job when used at frequencies up to a few hundred MHz (or even a GHz if you are prepared to trust them). But for aligning that 3.4GHz filter, what do you use? Surplus network analysers for GHz coverage are available, and several amateurs do have such items. But one of post-1980 vintage will still cost an awful lot of money – certainly a lot more than a spectrum analyser of the same age.

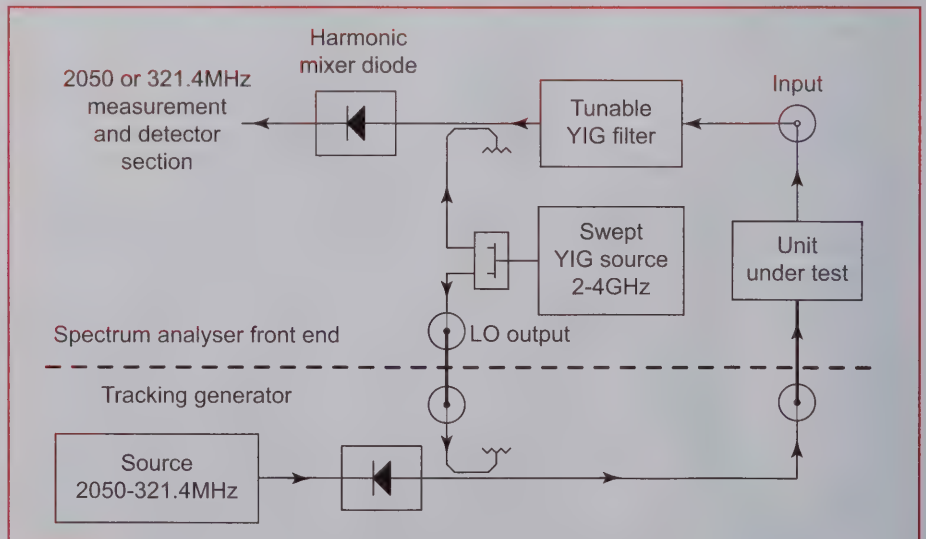


FIGURE 1: Typical spectrum analyser front end (top) showing the harmonic mixer and YIG oscillator described last month. The lower section shows a similar arrangement used in reverse to provide an RF output that always tracks the exact frequency the spectrum analyser is looking at. This can be used to test the frequency response of various items.

FIGURE 2: Tracking generator plot of a 2.4GHz single section ceramic filter.

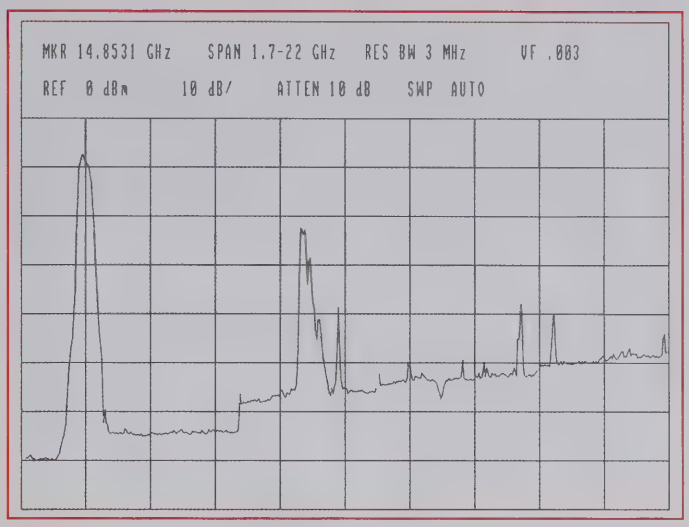


FIGURE 3: Full band plot of a 3.4GHz combline filter, showing the incidental third harmonic resonance

I had the harmonic mixer and directional coupler recovered from the old Ailtech described last month. The 2 – 4GHz LO from the new HP8569B is made available at a level of +15dBm from an SMA socket on the front panel – what chance this port was intended for just such a purpose? The HP instrument manual gives the IF used as 321.4MHz for the 1.7 to 22GHz ranges and 2050MHz for the low range of 10MHz to 1.8GHz. I had several choices of frequency source that will generate those frequencies, so was ready to go with a lash-up. **Photo 1** shows my breadboard. Initially I just fed the IF from a small synthesiser module at a level of 0dBm into the IF port, with no thought of biasing the mixer. The result was indeed a single line trace, whatever frequency band was selected, except there wasn't very much of it at all on the higher frequency bands – and what there was, was very dependent on IF drive level. There was a feeling that 'something more was needed'. That something turned out to be mixer bias.

## Biasing mixers

A single diode mixer such as the HP33801A works best and is more sensitive (read 'lower loss') when a small DC bias is applied, to make the semiconductor junction forward-conducting. The equipment manual mentioned "*mixer bias*" so it certainly was used in the HP unit. I initially added a bias tee, series resistor and lab PSU to send a milliamp or so though the diode. The amplitude of the trace rose several tens of dB on the higher frequency ranges, with significant improvement even on the lowest range. It was also a bit flatter. But what bias to use in practice? Just twiddling my milliamps changed things slightly, but such a hit-and-miss approach is just plain wrong. What was correct?

Consulting the single-page data sheet on the diode mixer came as a bit of a surprise. The only reference quoted "*...measured with LO power of 0dBm and 0.4 volts DC Bias*". Odd; isn't it more usual to pass a current though a mixer diode rather than impose a fixed voltage? I posed the question on the UK Microwaves Group and the response came back that mixers used in this way generally do work best with a fixed voltage that is temperature compensated. My bias arrangement was modified to a potential divider with a 39Ω resistor at the bottom end for a low source impedance, delivering a voltage adjustable around 0.4V. Great care and attention was needed to make sure the lash-up of connections could never come apart and feed excessive current from the PSU into the mixer – I only had the one and they are not cheap!

The result was a marginally better trace. Slightly changing the bias voltage each time could optimise the amplitude for each range. A 2.4GHz ceramic filter from the junk box was measured using this lash-up tracking generator. The plot from this is in **Figure 2**. The HP8569B has a button to select 'full band', where the spectrum analyser shows the entire band 1.7GHz to 22GHz across the display, doing all its internal range switching automatically. Using this with the tracking generator gives the trace shown in **Figure 3**, where a 3.4GHz combline filter is under test. The third harmonic response, where the resonators exhibit a response at 3/4λ is clearly visible, although as the frequency range has changed by this time, the relative amplitudes cannot be compared. The transition from one range to the next can be seen as sharp changes in amplitude.

Out of curiosity I looked in the equipment manual to see how the mixer biasing was done in the HP8569B – and that is where things got very interesting.

## Negative resistance

To optimise the amplitude response on each range using a different harmonic of the LO, the bias point is changed with the range. I'd found there was a connection between bias and gain with harmonic number when playing around blindly with the PSU setting so this came as no surprise but a paragraph in the manual describing the bias circuitry carries the almost throwaway comment "*The mixer diode is driven by a virtual negative resistance. This helps to keep the conduction angle constant as a function of local oscillator (LO) power into the mixer diode*". So now to the circuit diagram. There are five separate blocks of opamp circuitry for the bias, one switched in for each range. All have a similar arrangement, albeit with slightly changed resistor values, which will have been set up at manufacture to optimise each frequency band. The circuitry is shown in generic form in **Figure 4**. In the HP unit, R1 (both) are 100k and R2 10k for each of the bias stages. Rs varied in value from 23Ω to 46Ω, with Vr being set by a 10-turn preset resistor in each case.

That opamp circuit has an interesting property. It acts as a unity gain buffer for the reference input Vr, but the output voltage rises as output current, Io, is drawn. The effect of this is to appear as a negative source resistance. The equation describing operation is $Vo = Vr + Io \times Rs\ (R1 - R2) / R2$, where it can be seen that, provided R1 is greater than R2, output voltage rises with output current leading to a negative resistance characteristic looking back into the port. With the 100k and 10k values used here, the multiplier

**Andy Talbot, G4JNT**
andy.g4jnt@gmail.com

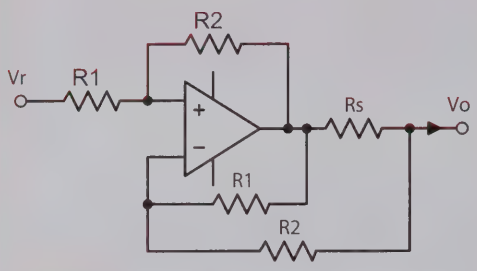


FIGURE 4: Analytical circuit of a generic negative resistance voltage source. Used for mixer bias to make it less sensitive to changes in mixing loss with RF drive (LO) level.

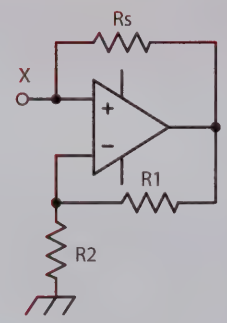


FIGURE 5: Negative resistance generator.

is 9 times the value of Rs, leading to an effective negative source resistance in the range of roughly 200 – 400Ω. A more detailed analysis of this interesting little bit of opamp circuitry, which can be described as a Thevenin equivalent source with a negative resistor, can be found at [1]. At the time of writing active biasing has not been added to the tracking generator setup, but I did make a quick breadboard of the opamp circuit to make sure it worked as theory predicted. It is quite disconcerting while monitoring the voltage on the output, to connect a load resistor and watch the reading go *up*.

## Resistance is futile

Figure 5 is an interesting little bit of circuitry first posted by Peter, G3PLX to the RSGB-Technical Group. There is no output connection, merely the point marked X. When 'measured', X exhibits a pure negative resistance with respect to ground, ie if a voltage is placed on it, current flows OUT of the connection. An analogue ohm meter, when connected here reads backwards (DVMs can't usually display negative resistance values, although it has been reported that one model does do so). The value of the negative resistance generated is equal to $R_{NEG}$ = Rs x R2 / R1.

And you can have fun with negative resistors. Connect a real resistance equal to $R_{NEG}$ in series with X and the result should look like a short circuit; connect it in parallel and it should appear as an open circuit (expect instability or opamp saturation). Connect an earpiece / loudspeaker and adjust $R_{NEG}$ to be close to the speaker impedance so it is just short of oscillating. It can help if you make part of R1/R2 a potentiometer so the effective value of $R_{NEG}$ can be varied smoothly without changing any components. Place the speaker at the end of a long tube or empty bottle and see it you can make the air in it resonate in the same way you can by blowing across the top. Connect a parallel LC circuit and use $R_{NEG}$ to cancel out the loss resistance to make an LC oscillator. This will have to be done at a frequency where the opamp still works properly, no more than a few tens of kHz for the average opamp. Peter has used this circuit in conjunction with a solenoid to keep a pendulum with a small magnet attached swinging indefinitely. If you build this opamp circuit to have a play and to experiment with, ensure the chip is run from positive and negative rails or that the 0V ground point is biased at mid-voltage.

Negative resistance is at the heart of many RF oscillators. Tunnel diodes, a now-obsolete semiconductor technology, have a region of their voltage / current curve that folds back on itself for a negative resistance region; they were used in UHF oscillators before decent bipolars and FETs came along. A capacitor between emitter and base of a bipolar transistor, or source and gate of a FET, results in a negative resistance on the input at certain frequencies, allowing various oscillator configurations. The well-known Colpitts oscillator can be analysed in this way, although there are other ways to view the operation of that circuit. At microwave frequencies, a physical capacitor across the B-E or S-G connections may not actually be necessary. Often the device junction capacitance alone is enough and some apparently very simple, low component-count oscillator designs can be found using this technique – just a resonator, a transistor with some bias components and a bit of decoupling.

**Websearch**

[1] http://g4jnt.com/nr.pdf


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- Auto ATU option

**SELF BUILD**
Why not self-build? Elecraft kits are designed to be easily built at home. No soldering is involved and there is no complicated alignment. The manuals offer step by step instructions with illustrations. A screw driver and several cups of coffee (not included!) will get the job done.

**KXPA100** 100W Amplifier .....Kit: **£899.95**
**KXPA100** 100W Amplifier .....Built: **£949.95**
**Optional Internal Auto**

## KPA500 Solid State Amplifier 160m-6m

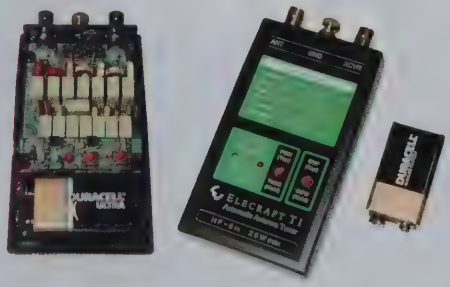
**2 Year Portsmouth UK Warranty**

Available as kit or ready built and tested
Built: **£2649.95** Self Build: **£2449.95**

- 160m-6m FET Amp
- 600W ouput
- RF Sensed Band Switch
- Fully Protected
- Fast & Silent QSK
- Low noise internal PSU
- Same compact size as K3
- Use with any transceiver brand
- Instant switch-on operation
- Only 35W drive needed
- 12kg desktop design

## The AMAZING QRP Auto ATU

### 150m - 6m 20W Wide Matching Range



**Ideal for IC-705!**

**£249.95 in stock!**

The T1's 7-inductor, 7-capacitor L-network provides a wide matching range and its re-tune time from memory is just 1 to 2 seconds. Equally important, the T1 always tries to achieve a 1.0:1 SWR - it doesn't stop at 1.5:1 or 2.0:1 like some tuners. You won't even need to change modes to tune. You can use SSB voice or a keyer as well as a constant carrier (AM, FM, CW, etc.).

## The New AX1 Antenna System

The AX1 antenna was designed by Wayne N6KR, co-founder of Elecraft. Whilst designed with the KX2 and KX3 in mind, it will equally appeal to all QRP operators. Handling up to 30W and covering 20, 17 and 15m, this telescopic whip fits easily into a pocket. Each antenna also includes a counterpoise wire. Additional accessories are also available as below.

**£109.95**

- Bands: 20 - 17 - 15m
- Power: 30W
- Radial: 13ft counterpoise
- Build: Corrosion resistant
- Collapsed: 15cm
- Extended: 1.15cm
- Weight: 90gm

**AXT1** Tripod Adaptor **£29.95**

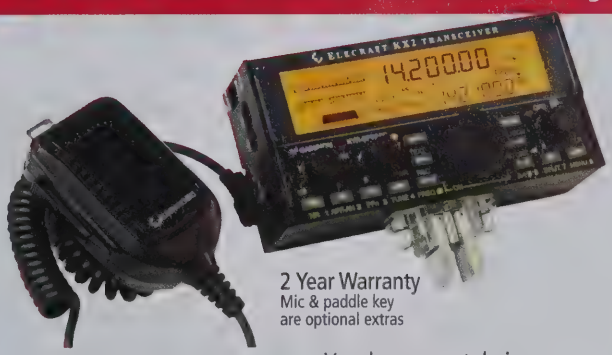
**AXB1** Desk Support Stand **£32.95**

**AXE1** 40m Coil

The AXE1 is a 40m add on coil that sits above the base of the AX1 and below the whip. This brings the system up to 4 bands, whilst retaining the pocket size of the system. The coil is 15cm long and because of its high'Q' an ATU is needed. (KXAT2 or KXAT3).

**£62.95**

## The KX2 offers a LOT MORE!
## 2 Year Portsmouth UK Warranty



2 Year Warranty
Mic & paddle key are optional extras

- 12 Watts Out 80m-10m
- Fits into a coat pocket
- Has built-in microphone
- Variable selectivity
- CW audio filter
- On screen data decode
- Very low current drain
- PSK31 and RTTY send
- Backlight can be turned off
- Internal ATU option
- 2 Channel SSB Recorder
- 3 Channel CW Data Recorder

## Elecraft KX3 160 - 6m, 15W

There is something very special about the KX3. It out-performs any similar transceiver and almost all of the base stations. You can run it at 100mW or increase to any power up to 15W (a bit less above 20m). You can add 2m or 4m, Add a narrow roofing filter or auto ATU. No other rig can match it.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## Diamond

**Diamond SD-330** Mobile HF Whip

Remote electrical tuning for your car

- 80m - 10m
- 200W SSB
- Height: 1.85m
- Fast tuning
- PL-259 fit
- 12V DC 100mA

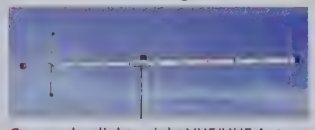
**£359.95**

**Diamond Splitters**

Cable splitters for FT-991A and IC-7900 and similar

MX-72A.....2m/70cms .....£39.95
MX-72N.....2m/70cms .....£37.95
MX-3000N.....2m/70cm/23cm .....£82.95

**Diamond VHF Yagis**



Great value lightweight VHF/UHF Antennas

A144S5R.....5 Element 2m.....£49.95
A144S10R.....10 Element 2m.....£79.95
A430S10R.....10 Element 70cm.....£49.95
A430S15R.....15 Element 70cm.....£64.95
A502HBR.....2 Element 6m.....£89.95

**Diamond Compact Dipoles**

**Choke Trapped**

**W-735**
40m/80, dipole 26m long. Rated at 1.2kW. Balun feed 50 ohm SO-239 .....**£89.95**

**W-8010**
80-40-20-15-10m Dipole 19.2m long with balun feed. Rated 1.2kW.....**£119.95**

**T2FD Compact**

**WD-330**
2-30MHz continuous 150W. Length 26m, balun + 30m coax cable.....**£199.95**

**W-330S**
2-30MHz continuous 150W. Length 10m with balun. Coax extra .....**£152.95**

**W-330J**
2-30MHz continuous 150W. Length 25m with balun. Coax extra .....**£134.95**

**Diamond Super Accurate VSWR Power Meters**

MADE TO MEASURE!

**SX-400**
140-525MHz 5/20/200W rms or peak power. FSD 4W .....**£83.95**

**SX-400N** N-socket version.....**£88.95**

**SX-200** 1.8 - 200MHz 5/20/200W rms or peak power. FSD 1W.....**£76.95**

**SX-100** 1.6 - 60MHz 30/300/3000W rms or peak power. FSD 3W.....**£89.95**

**SX-600** 1.8 - 525MHz 20/200W dual sensor. FSD 1W/4W.....**£149.95**

**Check out the Diamond Verticals on our website**

## Hustler HF Verticals

**4BTV**
40m - 10m 4 Band vertical that will handle full legal power and can be ground mounted
Height is 6.52m.

**£184.95**

**5BTV**
The ever popular 5-band model that covers 80m to 10m. This is a great backyard antenna that can be ground mounted.
The height is 7.64m

**£234.95**

**6BTV**
This antenna is identical to the 5BTV above buthas the 30m band added. Again it handles full legal power and stands 7.3m high.

**£289.95**

**All antenna are rated at 1kW**

## Diamond TOP SELLERS!

**Base Station Antennas**

X-30PL .....2m 70cms Vertical 1.3m..£49.95
VX-30N .....2m 70cms Vertical 1.3m..£49.95
X-30N .....2m 70cms Vertical 1,3m..£69.95
X-50N .....2m 70cms Vertical 1.7m..£52.95
X-300N .....2m 70cms Vertical .....£109.95
X-300PL .....2m 70cms 3.1m.....£99.95
X-5000 .....2m 70 & 23cm 1.8m.....£119.95
V-2000 .....6m 2m 70cm 2.5m .....£109.95
X-510N .....2m 70cm 5.2m .....£141.95
F22 .....2m Vertical 3.2m .....£64.95
F-23 .....2m Vertical 4.8m .....£89.95
D-777 .....Civil & Military Airband..£69.95

**Discone antennas**

D-130 .....25 - 1300MHz Tx .....£119.95
D-3000 .....50MHx - 3GHz Rx .....£127.95

**Mobile antennas**

AZ-510FX...Dual Band 0.92m .....£49.95
AZ-910 .....6m 2m 70cm 0.95m .....£49.95
NR-770HB..Dual band 1m .....£34.95
SG-7000.....2m 70cm 100W 0.5m.....£54.95
SG-7500.....2m 70cm 1.05m .....£59.95
SG-7900.....2m 70cm 1.58m .....£102.95

## ANTENNA TIME - 'Spring' into Action!

**MFJ Loops** for Attics or Small Gardens

NFJ loops are less than 1m diameter but are very efficient and the solution for those who have little space. The package includes the controller that adjusts the tuning of the loop via DC down the coax feeder.

**MFJ-1782X**....10MHz - 30MHz.....~~£449.95~~ **£439.95**
**MFJ-1786X**....10MHz - 30MHz.....~~£599.95~~ **£479.95**

**MFJ-1836** Cobweb

This is a great antenna for the small garden.

**£323.95**

6 Bands 20m - 6m rated to 300W. 9ft per side with 6ft turning radius.
Includes ferrite balun.

**Cushcraft A3-S** 1.5kW

The classic triband Yagi that will handle up to 1.5kW.

**£724.95**

**MFJ-1794** 7 Bands Vertical

Roof or ground mount. 7 bands: 40, 30, 20, 17, 15, 12, 10 Meters, full 1500W PEP. Full 11' collapses to 7'. Auto band switching, low radiation angle for DX, omnidirectional pattern. Highly efficient end loading; entire length radiates. Low SWR.

**£229.95**

**AV-12AVQ** 20m-10m

It's a classic and a great way to get on the the DX bands. Can be ground mounted and will handle up to 1kW. Self supporting.

**£199.95**

**MFJ-1846** Hex Beam

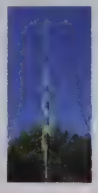
6 Bands 20m - 6m
2 elements on each band.
This antenna will handle 2kW yet will fit into many gardens. Turning radius 11ft and forward gain approx 6dB.

**£589.95**

**MFJ-1789** 40m-2m

Here's a compact rotary dipole that will fit in most gardens and covers 40m to 2m.

**£429.95**



**Hygain DX-88** 80-10m

t's one of our best selling ham radio verticals, not least because it covers so many bands.The eight bands covered are 80-40-30-20-17-15-12-10m. Will handle up to 250W on all bands.

**£489.95**

## Cable Packs

**RG-213 Coax Cable Packs**

RG-213-10 .....10m Pack .....£11.00
RG-213-20 .....20m Length .....£22.00
RG-213-25 .....25m Length .....£27.50
RG-213-50 .....50m Length .....£55.00
RG-213-100 ....100m Drum.....£99.95

**RG-58 Coax Cable Packs**

RG-58-10 .....10m Length .....£5.00
RG-58-25 .....25m Length .....£11.50
RG-58-50 .....50m Length .....£22.50
RG-58-100 .....100n Drum.....£39.95

**450 Ohm Ladder Line Packs**

TAF45010.....10m Length .....£9.95
TAF45020.....20m Length .....£19.95
TAF45030.....30m Length .....£29.95
TAF45050.....50m Length .....£49.95
TAF450100.....100m Length .....£99.50

**300 Ohm Ladder Line**

TAF30010.....10m Length .....£8.95
TAF30020.....20m Length .....£16.95
TAF-30030.....30m Length .....£25.50
TAF30050.....50m Length .....£42.50
TAF300100.....100m Drum.....£76.50

**Flexweave PVC Antenna Wire**

FW-PVC-20.....20m Length .....£13.95
FW-PVC-50.....50m Length .....£44.95
DR-FW-PVC .....100m Drum.....£69.95

**Two Great Dipole Centre Baluns**

**Diamond BU-50**
1:1 HF Balun
Covers:
1.7MHz-40MHz **£29.95**

**Diamond BU-55**
1:1 HF Balun
Covers:
3MHz-75MHz **£39.95**

**Our On-line Sales facility is still OPEN but our Shop is currently CLOSED.**
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# ICOM TOP RADIOS

**Each of these radios built from the ground up and featuring the very latest SDR technology. Now leading the design trends in Japanese Ham radio.**

## IC-7300

The IC-7300 has quickly become a piece of ham radio history. A marker by which the competition is judged. The fastest selling radio of 2017 and still going strong, replacing all those old radios that many hams gave clung to for years. It's a great performer and great value. 160m - 4m. 100W Max. **£1195.95**

## IC-7610

The new IC-7610 transceiver is now a reality. Few can fail to be impressed with the advanced technical promises. And nobody should be disappointed once their new radio arrives. We have good orders in for this radio and so will be happy to bring your dreams to reality. And if you need any additional items to go with your new radio then we are sure that we can delight you. 160m - 6m. 100W **£2999.95**

## IC-9700

The IC-9700 brings together the three popular VHF bands and puts them into one very high tech. box. The large screen, packed with information, will be a welcome addition and copies their HF range in presentation and flexibility. Top of the feature list is SDR employed on both 2m and 70cms, with all the benefits that go with this. And there is no extra charge for the 23cms down converter which will be the icing on the cake for many. The recent trade demonstration showed us just what a great radio this is. Call us today for a quote. **£1795.95**

**Other Transceivers**

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| IC-7100 | 100W All Mode with remote head | £999.95 |
| IC-R8600 | 10kHz - 3GHz Comms. Receiver | £2489.95 |
| IC-R30 | Handy All Mode Digital scanner | £569.95 |

## Icom Outdoor Radio

**D-51E Plus**
22m & 70cm

- 5W Dual Band
- FM and D-Star
- Free Downloads
- GPS Receiver
- Access Mode
- Terminal Mode
- AM & FM Receive

The Icom ID-51E Plus 2 is Icom's latest and mpst advanced handy transceiver. It has a host of features that will keep you in touch locally and world wide! **£379.95**

**ID-5100E D-Star**

Here we have the feature packed mobile that delivers 50W of dual band power. Offering both FM and D-Star with programmable features that enable worldwide communication. **£574.95**

**IC-2730E**

This radio is a rugged workhorse. 50W of FM on 2m and 70cm. Keypad mic. and remote head. It has AM and FM receive for out of band reception such as airband and marine. **£299.95**

## AOR AR-8600 MkII

- 100kHz - 3GHz
- SSB, CW, AM, FM, WFM
- Airband 8.33kHz
- 2000 Memories, 40 Banks
- Card Slots
- RS-232 and 10.7MHz output
- Dual VFOs

## Can you monitor all the Bands?

By the time you read this we should have more stocks of the latest version of this most amazing receiver. It covers all the Ham bands that you are ever likely to want to monitor. That in itself is quite an achievement, and at a very competitive price. Add to that all the other services it covers including airband and marine and you have a great package in a very small space. And tuning is easy with steps down to 50MHz so no problem with SSB and CW. Perhaps it is time that you added the capability of monitoring the complete radio spectrum to your radio station. What better than using a model from AOR Japan. **£649.95**

See our website for full spec!

## ICOM IC-705

- All Mode 10W Transceiver
- 160m-70cm + DSTAR
- 10W QRP portable transceiver
- Rx: 30kHz-146MHz

**£1299.99**

# YAESU Part of our Range

## FT-3DE Digital Handheld

The Yaesu 3D is one of our top sellers. The touch screen makes it so much easier to get up and program. Its a smart phone performance for ham radio!
High resolution screen with bandscope display. Digital and analogue operation on 2m & 70cms. Features wide band receive and has GPS reception. A great travel radio. **£399.95**

## FT-991A HF - 70cms 100W max

This is a real top seller. It's the one radio that you can put on the desk and enjoy HF and VHF. Includes ATU. **£1239.95**

## Yaesu FT-dx101D

Now top of the Sherwood list for SDR HF Technology. When you buy from us you also get a 3-Year Yaesu UK warranty. The new Yaesu FT-DX101D embraces SDR in an interesting way. You have full SDR technology but they have added a selectable superhet front end to provide optimum dynamic range and front end selectivity. The full colour touch screen offers variable bandwidth up to 1MHz, with clever screen presentation options and a rear panel HDMI output for an external display.

**£3149.95**

**Full range of Yaesu products stocked. Call for Quotes**

**Peter Waters G3OJV**, operates the first FT-dx101 to come into the UK.

## YAESU CASHBACK

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|---|---|
| FTdx-101D | £90 CASHBACK |
| FTdx-101MP | £90 CASHBACK |
| FT-991A | £70 CASHBACK |
| FT-818ND | £105 CASHBACK |
| FT-891 | £70 CASHBACK |

Valid until June 30th

# AOR Receivers Japan

## AR-DV1

Multimode digital demodulation receiver featuring wideband reception, D-STAR, Yaesu Fusion, DMR and much more. **£1199.95**

New!

## AR-5700D

9kHz - 3.7GHz Multi-Mode, Digital Video Out, I/Q Out professional communications receiver that offers a level of versatility and capability, beyond that of any similar receiver. See our website for full spec! **£4,595.00**

## AR-DV10

The AR-DV10 is the most advanced digital handheld receiver covering covering 100kHz - 1.3GHz. The latests firmware upgrade now adds comprehensive trunk monitoring.

**£939.95**

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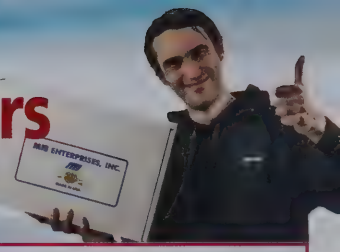
Latest Versions - Full UK Warranty



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## Check our web site for all the latest prices. Check Our Youtube Channel for Reviews.

**MFJ-259D**
Antenna Analyser

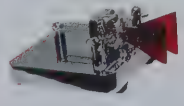
530kHz to 230Mz. The ham radio standard tool for antenna work. AA cells or external 12V

**£329.95**

**MFJ-401E**
Memory Keyer

A great electronic keyer with memory. Use PP3 or external 12V

**£99.95**



**MFJ-564**
Iambic Key

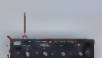
Here's a smart iambic key with heavy base

**£129.95**

**MFJ-557**
Morse Trainer

Great for learning CW. Has built-in oscillator with volune control. A winter challenge. Kearb CW.

**£58.95**



**300W Dummy Load**

| | | |
|---|---|---|
| MFJ-260C | SO-239 | £57.95 |
| MFJ-260CN | 'N' type | £62.95 |

**MFJ-1026 NO MORE NOISE!**

Can be used with any transceiver. PTT input provided.

The built-in whip senses local noise and feeds it out of phase with the incoming signal. The noise goes and the signal stays!

**£239.95**

**MFJ-464 XW**
Keyer and Reader

It will decode CW and allow you to plug in a keyboard to send CW. How clever is that?

**£239.95**

**MFJ-993B**
Auto ATU

Probably the most popular base station auto ATU. Really fast tuning and handles wire, coax and balanced

**£359.95**

**SPECIAL PURCASE**

This 22ft fibreglass mast has locking sections. It is thick walled with 2" bottom section and 3/4" top section.

**£149.95**

**SEE VIDEO!**

See YouTube 'MFJ-1904H'. We show how it supports a VHF Yagi Antenna.

## AL-811XCE AMERITRON HF Linear Amp

Ideal for the UK Ham radio licence you get 600W output and a perfect match for 100W transceivers. That's 6dB of gain on all bands. Three low cost 811A tubes give you great efficiency and a clean signal. A single PTT line and RG input is all that is needed.

**£1199.95**

## MFJ-939 Plug & Play Auto ATU

Here is an auto ATU with models dedicated for Yaesu, Kenwood, Icom and Alinco. Each one comes with a lead that plugs directly into your radio that provides power and operating signals back to the ATU. Tell us the model of your radio when ordering.

**£195.95**

**Ready to go!**

## NEW! MFJ-948 ATU

One of the most popular ATUs covering 160m to 10m and handles 300W. Can be used with coax, end fed wires or balanced ladder line. Whatever antenna you use or this will handle it all.

**£199.95**

## NEW! MFJ-9232 Loop Tuner

Wire included to make your own loop - indoors or out. 80m-10m 25W Max. Have some fun with this!

**£69.95**

## Watson W-8683 Wireless Weather Station

It gives you up to date information on local weather, pressure and forecast.

- Date and time radio linked
- 12 or 24 Hour
- Inside and outside humidity and temperature
- Celsius or Farenheit

**£29.95**

## Antenna Rotators

**AR-500X**
Smaller VHF Yagis

Programmable controller
Uses 3-core cable
28044mm masts

**£189.95**

**Create RC5-3**
For HF Yagis

400kg vertical load
Flat mount
7-core cable

**£679.95**

**MC-2**
Lower mast clamps

**£119.95**

### Hy-Gain Precise Controllers

**YRC-1X** For Yaesu

**£369.95**

**YRC-3X** For Yaesu

**£449.95**

EME? The YRC-1X connects to Yaesu controller to provide precise degree accuracy with USB interface for software integration. The YRC-3X adds additional features and extensive memory channels. Full details on our website.

### Yaesu Rotators

**G-450CDC**
**£339.95**

| | |
|---|---|
| G-1000DXC | £499.95 |
| G-2800DXC | £949.95 |
| G-5500 | £654.95 |
| GC-038 Clamps | £29.95 |
| 25m Cable set | £69.95 |
| 40m Cable set | £107.95 |

### Spid Rotators

**Alpha SPID RAU**
with worm drive

**£545.95**

| | |
|---|---|
| Alpha SPID RAEL | £569.95 |
| Alphas SPID RAK | £595.00 |
| Alpha Big RAK | £879.95 |
| Alpha SPID RAS | £999.95 |
| Alpha Big RAS | £1429.95 |

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# 'Get on the air to care' – amateur radio in the media

The National Health Service and the Radio Society of Great Britain
Working in partnership to improve the health and wellbeing of our communities

**We're seeing an unprecedented interest in amateur radio in the mainstream media, stemming from the national 'Get on the air to care' campaign we launched in April in partnership with the NHS.**

At the time of writing, in addition to the major BBC News online article that made the front-page news, the growing interest in amateur radio has resulted in interviews or case studies on TV programmes, in ten radio interviews, five newspapers and four international online news outlets. We've received four videos of support and seen a BBC radio station tweeting about our campaign even though they hadn't carried an interview with us!

We're delighted that the amateur radio media has also got behind the campaign, sharing details in monthly publications, on websites and in weekly news updates.

## Behind the scenes

From the launch onwards, the RSGB has been working hard behind the scenes, sending out countless press releases, chatting to journalists, providing a range of interesting stories and demonstrating that amateur radio is very much alive, well and relevant. Not every phone call or email produces fruit but seeds are always sown; we have tracked the snowball effect of some local radio stations seeing our national campaign profiled on the BBC website and then thinking it would be interesting to chat to someone about amateur radio in their area.

Radio amateurs stay connected during lockdown

## Local involvement

It has been great to see clubs and individual radio amateurs getting involved, either contacting their local media or being willing to be interviewed, sharing their stories about how amateur radio is helping them to cope with the restrictions and the difficulties of social isolation. They've had chance to explain what amateur radio is, the range of things you can do and how they're supporting one another through nets and online meetings.

It is never easy to do an interview and we congratulate those who have put themselves in the limelight, shared their enthusiasm for amateur radio and done their best to explain it to a listening audience who know little or nothing about this great technical pastime.

## Interesting stories

RSGB General Manager Steve Thomas, M1ACB and Paul Devlin, G1SMP, NHS England Emergency Care Improvement Support Team and also RSGB District Representative, have been interviewed a number of times as they were the primary spokespeople for the launch. However, there have been numerous individual radio amateurs and local clubs featured in the weeks since.

Eleven-year-old Anne Marie, 2E0RUX was chosen from a number of radio amateurs we put forward for the BBC news online article. Not long after she was profiled in that, she was interviewed by her local BBC Radio Cornwall when she was nominated by her headteacher as a 'Hero of the week' for running two weekly nets for local radio amateurs during the lockdown. This is just one example of the snowball effect and we were delighted for Anne-Marie that she has had more than five minutes of fame!

Others have got involved too, for example Chippenham & District ARC were interviewed on BBC Radio Wiltshire, Telford & District ARS were featured in the *Shropshire Star* whilst RSGB Board Director Mike Bruce, M0ITI was interviewed on talkRadio.

Barry ARS re-enacted Marconi's first CW transmission across the Bristol Channel for the ITV Wales programme *Wonders of the Coast Path* with Sean Fletcher that was broadcast this month. Whilst it was filmed last year before the restrictions caused by Covid-19, it is another great example of a local club demonstrating amateur radio in an accessible way in the media.

## Reaching new audiences

Whilst it may not always be obvious that the RSGB is behind a media story, be assured that your national Society is working hard on your behalf to bring amateur radio to the mainstream media. The numbers of people we are reaching by this successful campaign are significant and increase each day. It is drawing people to get involved in amateur radio for the first time and is rekindling an interest in those who used to enjoy it in previous years.

Logos used with kind permission.

## How you can get involved

Our 'Get on the air to care' campaign will continue over the coming months and there are ways you can help to raise awareness of amateur radio during that time.

Firstly, if you use social media then please like/share/retweet our news about media coverage – your own contacts then might do the same and even more people will get a chance to read, watch and listen to the stories we're sharing.

Secondly, we are always looking for more great stories so do get in touch via the email address below if you'd be willing to share your experiences with the media. If you want to contact your local paper or radio station directly, just go for it – take a look at our 'Get on the air to care' media page and be inspired! www.rsgb.org/gota2c-media.

Heather Parsons
Communications Manager
comms@rsgb.org.uk

# 83rd Commonwealth Contest 2020

**The 83rd Commonwealth Contest took place on 14 and 15 March, with everything from wildfires in Australia to Coronavirus lockdowns and chaos for the travelling entrants.**

Propagation was predicted to be as poor, as last year, with the solar flare index (SFI) stuck at 69/70 – still bumping along the bottom. And, just to add more problems, Australia had just had widespread forest fires (see photo below opposite, with VK2GR and the bushfire only 4 minutes away).

Entries held steady though, with a slight increase to 271 stations. The chart, **Figure 1**, shows that the overall number of entrants has been pretty stable over the past 10 years, lying between 250-300; as has the percentage of entrants in the main sections. Even the percentage of Unassisted/Assisted stations now seems to be settling down at around 40%.

Plenty of DX was to be found as the following list of active Commonwealth call areas shows 3B8 and 9, 5B, 6Y, 8P, 8Q, 9G, 9H, 9J, 9M0 and 2, 9V, 9Z, C4, C6, V3, V5, VE1 to 7 and 9, VK2 to 8, VO1 and 2, VP2, 5, 8 and 9, VY10,1 and 2, ZB2, ZD7, ZF, ZK, ZL1 to 4 and ZS1,5 and 6. Not all of these were worked from the UK, of course. It was great to have 6Y5HN and 6Y5HS back again.

On 28MHz it was mostly 'local' QSOs but a few more interesting ones were logged such as between 9V and VK6, 3B8 and VU and 9H1 to VK8. The 21MHz band was more productive but even there openings were short and only the best equipped stations were able to take advantage. Most activity was therefore concentrated on 3.5, 7 and 14MHz, which inevitably led to band congestion.

PHOTO 1: Phil, ZL3PAH of Team Quake Contesters.

## Open Unassisted Section

The Senior Rose Bowl is awarded to the leading station in the Open Unassisted section and this year it goes to Ron Vander Kraats, VE3AT, operating as CF3A. Ron has been a long time entrant in BERU, taking 4th place last year and 2nd in 2018. Dave Goodwin, VE9C, is in second place with last year's winner, Jeff Briggs, VY2ZM, who operated for 12 hours, third. He takes the VP8GQ trophy. Leading VK is again VK6LW followed by VK6VZ, who said, "True bottom of the solar cycle conditions 10m dead, 15m barely a pulse, 20m struggled to life at times, 40m truly alive and 80m gave hope of having a good total score".

The Colonel Thomas Rose Bowl is awarded to Dave Lawley, G4BUO, who operated from the M6T contest site. "Even in these low sunspot times, the magic of BERU remains", he commented. Dave takes this trophy for the 13th time since 1990 and is now not far behind G3FXB who won the trophy a total of 17 times between 1973 and 1991. Next highest G station was GM4YXI who said, "Thanks to all the travellers – if it were not for you guys this would be an even tougher event".

## Restricted Unassisted Section

The Junior Rose Bowl goes, for the fourth year running, to Peter Hobbs, G3LET with an outstanding score from VP5O. "It's hard to comment rationally on conditions... 80 in particular was disappointing to the UK... I spent ages trying to make it with Nigel (3B8) but signals were too poor and fluttery. 40 was marginal too... yet 15 was open on and off all day to the UK" reported Peter. In second place is Brian, VK3MI who said, "I was pleased to see a noticeable increase in the number of QSOs on both 40m and 20m this year".

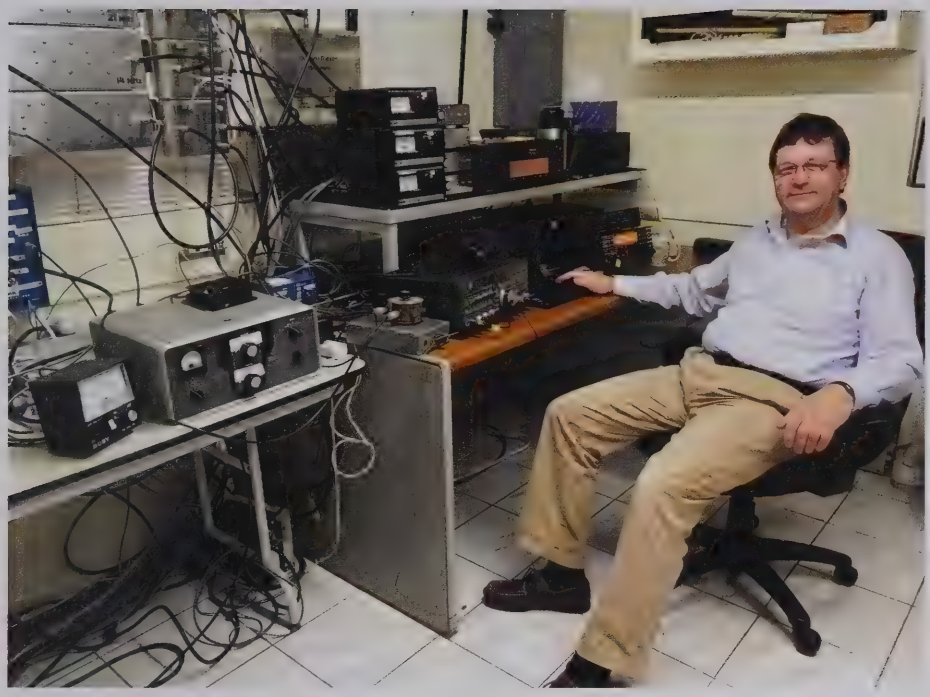
This section is popular with the travelling group. Mike, VK2/G3VYI operated from a 'dunny' somewhere in New South Wales. "I had a great site in a campground in south NSW overlooking the Pacific/Tasman sea and local lagoon about 100 feet up".

The leading UK&CD Restricted Unassisted entry and winner of the John Dunnington, G3LZQ Trophy is Andy Summers, G4KNO. "The 20/15/10m antenna is a rotatable nest of apex-up delta-loops made from fishing rods and wire... makes a huge difference being able to point it in the right direction".

The leading UK&CD 12 hours duration Unassisted entry and Ross Carey Rose Bowl winner is Andy Cook. G4PIQ "the only Tx antenna I had left working after the storms being a 40/80m dipole".

## Open Assisted section

The Rosebery Shield is awarded to the highest single operator Assisted score, this is usually in the Open section and this year is no different. John Sluymer, VE3EJ is this year's recipient. Second place in the Open Assisted section is VE5MX.



Colin, G4CWH in the shack at ZF2CA.

## Restricted Assisted section

In the Restricted single operator Assisted section, the leading station, for the second year running, is Bryan Turner, G3RLE. In second place is G3PHO.

## QRP section

QRP is hard work when propagation is poor so, unsurprisingly, there were just two entries in the 5W section this year. With an Assisted entry, first place goes to Alan Horne, M7R/GOTPH and in second place Unassisted is Eric Castro, VA3AMX. Eric's is therefore the highest placed Unassisted entry, so he receives the Lilliput Cup.

## Commonwealth Medal

A Commonwealth Medal is awarded to Derrick Webber, G3LHJ. Derrick has been a regular supporter of this contest since first entering in 1958 in the 21st BERU (when he came 22nd in the Low Power section). I also noted G3LET in the High Power section that year. Back then the High Power section was won by ZS6DL with 5-ele on 10m, 4-ele on 15m, 6-ele on 20m and 2-ele on 40m! HROs and NC100/200 with crystal controlled converters for HF were much in evidence. This also saw the debut of the Collins KWM1 and KWS1, the shape of things to come.

Four minutes before the bushfire at VK2GR.

## Headquarters Stations

Once again a big thank you to all the excellent HQ stations providing bonus contacts on every band. There were twelve HQ stations this year and in the top spot is GB5CC operated by Don, G3BJ. "The 80m path to VK/ZL was in two halves for me – good to VK on Saturday evening, and good to ZL Sunday morning". In second place was G6XX (operated by Graham, G4FNL). Australia didn't quite manage to equal last year's record of six HQ stations but still had four. VK5WIA was their highest placed operated by Grant, VK5GR, "I was particularly happy to work some eastern Canadians on 80m... likewise I managed a couple of G stations". Canada fielded two HQ stations, VA2RAC operated by Claude, VE2FK who said, "Conditions were good, especially on 20m Saturday morning, G's were so loud, over S9". He was just ahead of VE7RAC.

## Teams

In the team event, despite the latitude factor again being adjusted to reduce their advantage, Australia (VK6LW, VK2BJ, VK4CT, VK6VZ, VK4SN) (**Figure 2**) have kept their Canadian challengers (VE3EJ, CF3A, VE9CB, VE3NNT, VE3BR) in second place for the fourth year running. However, Canada did manage to field four teams again this year, (Loonies, Twoonies, Dimes and Quarters). The names may seem unusual; they are all nicknames for Canadian coins. In third place are the World Travellers (VP5O, ZF2CA, 3B8XF, V31GX, 9G5XA) and another Southern Hemisphere team, Quake Contesters, are close behind in fourth. Top UK team was Grimsby Mariners (G3TBK, G3SJJ, G3RXP, G4EBK).

## Travellers Tales

World travellers visited 3B8, 8P6, 9G5, V3, VK2, VP5 and ZF. The Travellers Award is

**Bob Whelan, G3PJT**
bob@g3pjt.com

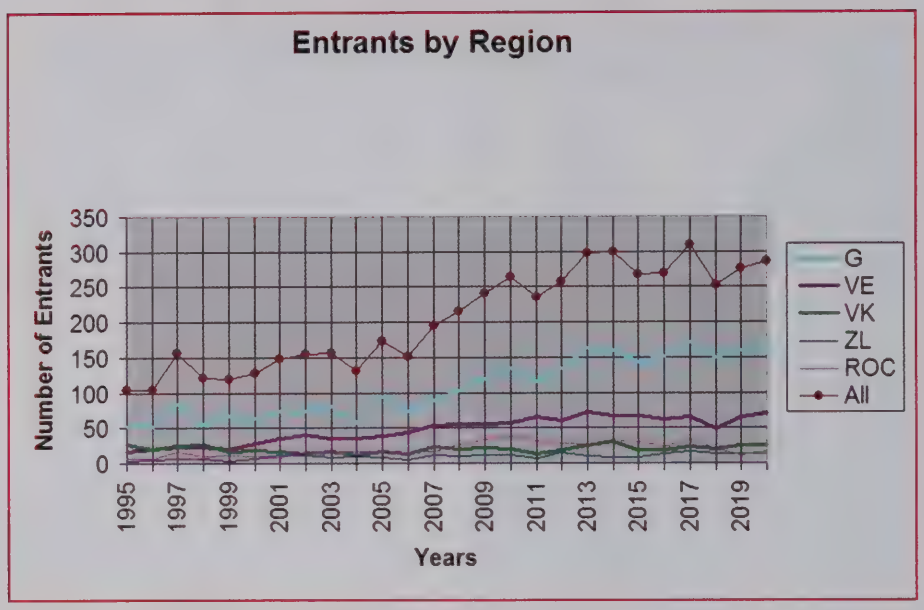



FIGURE 1: Number of entrants by region.

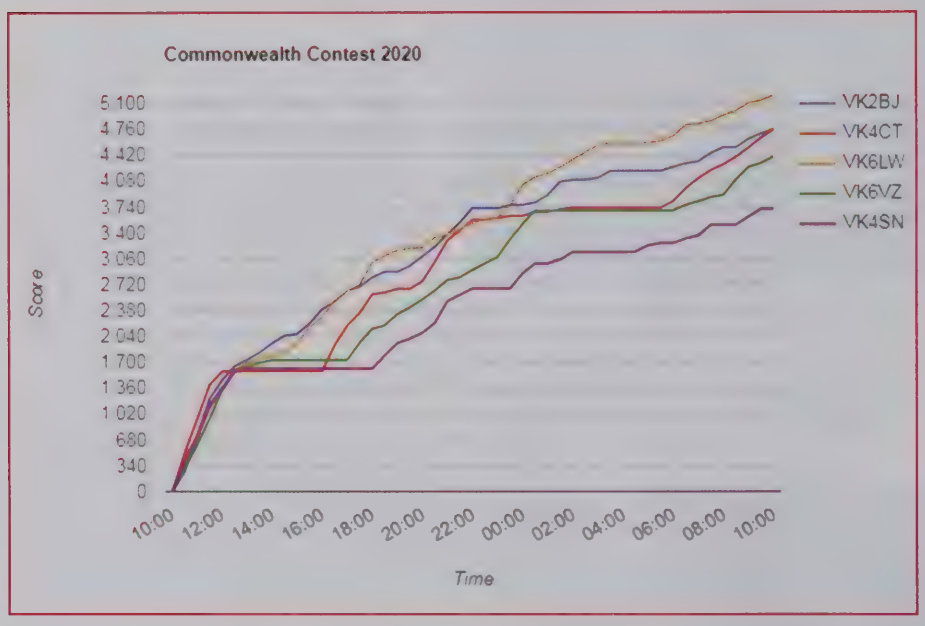



FIGURE 2: Team Australia 1 activity profile.

this year made to Iain, V31GX/G4SGX, richly deserved after a hair-raising return. "The day after I arrived, they banned any more Europeans from entering Belize and the US set up a ban on arrivals from Europe unless they had been away for 14 days, which was a problem. All flights to England go via the USA from Belize and the USA has no real transit area, you have to physically enter the USA and go through immigration, customs etc. No problem I thought, at least I got in and it just means another extra week in Belize, so I booked another flight. Alas I could not get a refund for the first return flight. About two days into my second week, five days before returning, there were rumours about Belize closing the land borders, despite having no cases of the virus confirmed as yet. The next day I received a message from my hosts, which was sent to them from a government friend, that all the land borders will close at 4pm the next day and the airport a day after that (before my ticket home). Left with no choice, I got into a taxi the next morning to the Mexican border, walked across and then found a bus to Cancun with the hope of getting a flight out from there, being a much larger and busier airport than Belize (and it was in the back of my mind that if I did get stuck, Mexico was probably a better place as it had more infrastructure). I booked the only flight out to London from Cancun, going via Canada. Due to number of people also trying to escape, all tickets were full for days apart from Business Class, which I reluctantly bought as again I was running out of options. The day of departure, I got a phone call from a friend, who was trying to help some friends stuck in Panama, telling me that Canada had just closed its borders to non-Canadians. But when I tried to check in online it refused me, stating the new travel restrictions. I went to the airport where they agreed new rules were in place since that morning and I would have to contact the airline directly to arrange a refund. Now thinking that waiting for repatriation was my last and only hope, I just tried to check in anyway, with one of the machines. To my great surprise it printed out two boarding passes but stated I would have to speak to check in assistance to confirm. Fearing the worst I queued up anyway. By this time confidence was running low and expected to be turned down but they just waved me through. Waiting for the plane, it was repeatedly delayed by half hours several times, so I was still worrying about a last-minute cancellation. There were plenty other Europeans in my situation waiting for the plane, from all over South and Central America, looking for that elusive non-USA bound transit flight to EU. Finally they let me on and we left Cancun and I transited to London with no problems. I'm lucky that I'm fairly used to thinking on my feet, having travelled quite a lot in my youth, but even I acknowledge that was a close thing..."

And from fellow traveller Colin, ZF2CA "I managed to get a place on the BA flight that leaves Friday as the US leg of my trip had to be cancelled... Cayman airport will shut from Sunday evening for three weeks...!"

## Adjudication

As an epilogue to the 2020 ZF2CA entry, Colin was caught out by a Dxlog logger error that he failed to spot before uploading amid all his Covid-19 woes with return travel and disruption to his own business. The short story is that his final log included no HQ bonuses, despite them having been logged. After now working line by line through the log and his UBN, his calculations are that he would have scored 7445 points and therefore 2nd in SOU. He did appeal to the HFCC but only after publication of the results, so unfortunately his appeal was rejected. Of course, the decision of the RSGB is final, which he has accepted.

And my thanks to the Adjudicator and all the contributors, especially the for the photos! To Steve, VK6VZ, Brian, VK3MI, Dave, VE9CB, Steve, GW0ETF, the team captains and all the participants – see you all on 13 and 14 March 2021.

Full Results: www.rsgbcc.org/cgi-bin/hfresults.pl?Contest=Commonwealth%20Contest&year=2020&Soapbox=show#Restable

Commonwealth Contest website: https://berucontest.wordpress.com/

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# Siglent SVA-1032X

## Spectrum and Network analyser

**The Siglent SVA-1032X is a spectrum analyser and tracking generator covering 10kHz to 3.2GHz combined with a Vector Network Analyser (VNA) covering from 100kHz to 3.2GHz.**

The performance specifications the SVA-1032X are impressive with a -165dBm/Hz displayed average noise, 1Hz minimum resolution bandwidth (RBW) and -98dBc/Hz offset phase noise. Connectivity is well provided with USB and Ethernet interfaces along with an integrated web server provided as standard. As you can see from the photos, the front panel is dominated by a large, touch controlled 10.1" display that can show multiple traces of the same signal so you can simultaneously examine different facets. Before I delve into the detail, I'll run through a few spectrum analyser basics.

PHOTO 1: Siglent SVA-1032X front panel.

### Spectrum analyser introduction

For anyone new to spectrum analysers, here's how the SVA-1032X operates. With a such a wide frequency coverage and a bandwidth adjustable down to 1Hz, a spectrum analyser is an unavoidably complex device. Although digital signal processing has transformed modern test equipment, the front end of most spectrum analysers remains firmly in the analogue domain. A simplified block diagram is shown in **Figure 1**. After some initial signal conditioning, the incoming signal is passed to the first mixer. This upconverts the incoming signal to an intermediate frequency (IF) that is above the highest frequency handled by the spectrum analyser. This is necessary to ensure there are no gaps in the coverage. In the case of the SVA-1032X, that means an IF above 3.2GHz. The local oscillator for this first mixer is usually voltage controlled by a sweep generator to cover the full range of the analyser. For example, if the 1st IF was 4GHz, the local oscillator would need to sweep from 4.000,010GHz to 7.2GHz to give a spectrum analyser coverage of 10kHz to 3.2GHz. The sweep generator also provides a feed to the display driver so that the horizontal axis of the display tracks the changing local oscillator frequency. That way, each pixel of the display can be used to represent the amplitude of the signal at that frequency and so produce the classic spectrum analyser display.

After some filtering and amplification, the first IF signal passes via two more down-converting mixers before it reaches the final IF of around 20-30MHz. It is at this stage that the signal is digitised using an analogue to digital converter (ADC), a 12-bit device in the SVA1032X. Once digitised, Fast Fourier Transforms (FFTs) and other digital filtering and analysis techniques can be used to examine the signal in great detail.

When it comes to making measurements with a spectrum analyser, it's important to familiarise yourself with spectrum analyser principles to get the best results. One of the best references on the subject you can find on the web is Keysight Application Note 150.

As with all measuring instruments, it is important to understand precisely what the instrument is measuring. All spectrum analysers have a finite number of measurement slots for each sweep. For this description, let's call these slots 'buckets'. I'll also make some assumptions with easy numbers to illustrate the point. If we were to sweep between 0Hz and 100MHz with an analyser featuring 1000 measurement buckets, each measurement bucket would contain the signal power from a band of frequencies 100kHz wide. So, here's the first question? As each bucket represents such a wide band of frequencies, we need to decide how to process that information. Do we record the peak value of the strongest signal in

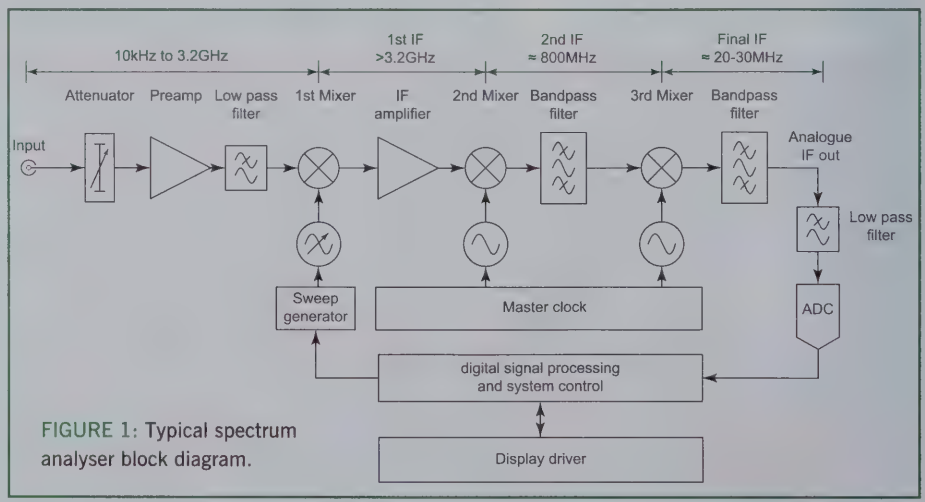


FIGURE 1: Typical spectrum analyser block diagram.

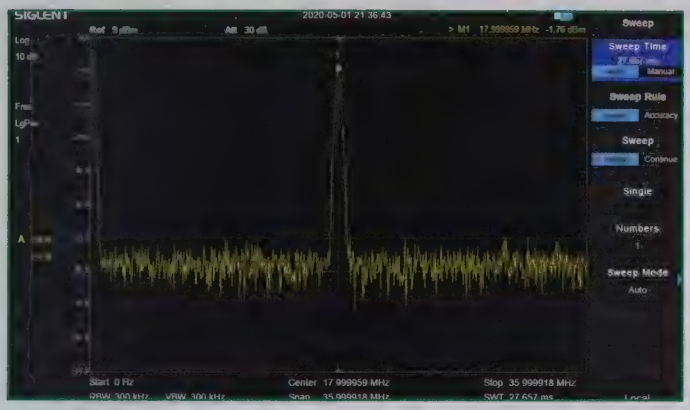


FIGURE 2: Single carrier display after using the Auto Tune feature.

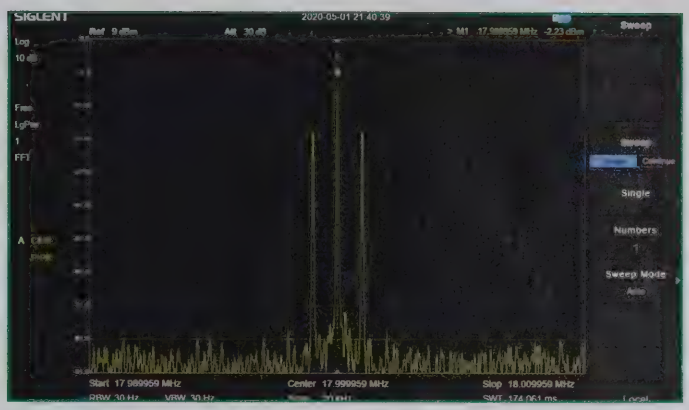


FIGURE 3: Modulated 14MHz carrier..

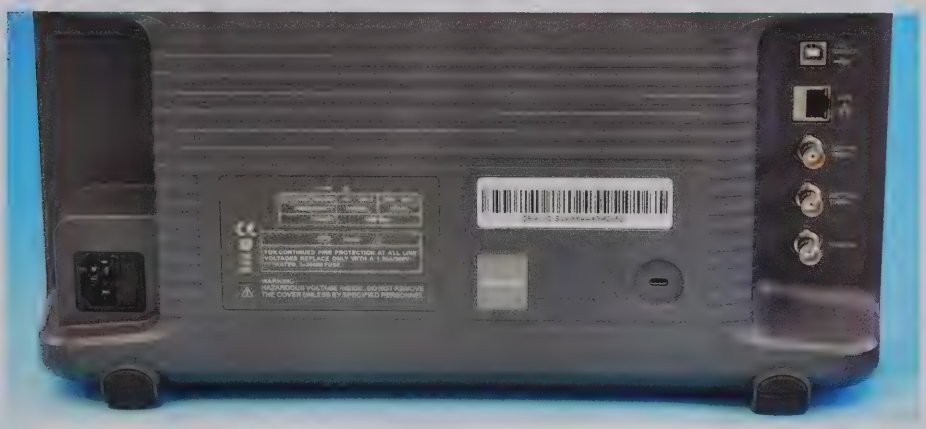

PHOTO 2: Siglent SVA-1032X rear panel connections.

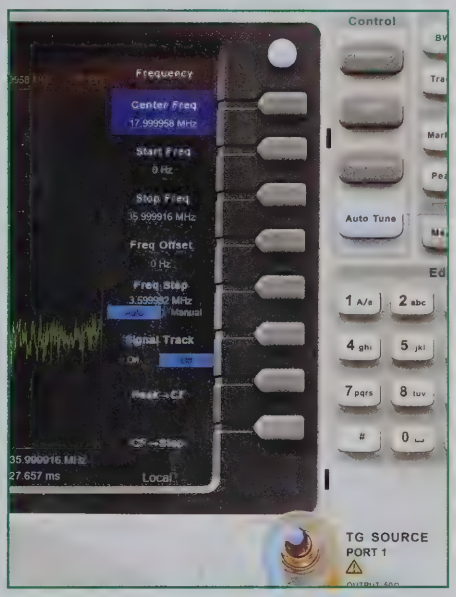


PHOTO 3: Front panel soft-buttons used for parameter selection.

that band, the minimum value, RMS value, an average, or something else? In fact, all these are valid measurement options and the choice depends on what information you are trying to capture. If you are measuring noise, then some form of average would be reasonable (as noise is a random signal). However, if you were plotting a steady signal, such as a carrier from a transmitter, the peak value might be more appropriate and provide a more accurate representation. Most spectrum analysers, including the SVA-1032X, include a choice of measurement options.

Having determined how we want to process the information in each bucket, there is often a second choice to be made regarding the display. There may well be considerably more measurement bins in a single sweep than there are pixels on the display. To make use of the previous example, if our analyser screen had just 500 horizontal pixels that would mean that each pixel would have to represent the signal power from two buckets. We therefore need to decide how to handle that in much the same way as we did for each measurement bucket.

Whilst this may sound overly complex, a good spectrum analyser, like the SVA-1032X, will include a range of default settings to ease the burden on the operator. Nevertheless, it is important to understand the compromises that may affect your measurements. Remember, if the results look *too* good, they probably are.

## Exploring the panels

The front panel of the SVA-1032X has a clean layout with all the buttons grouped neatly together on the right of the panel, **Photo 1**. Immediately to the right of the large display are a set of eight software defined buttons whose function is indicated by the display. This system provides excellent contextual controls that are easy to use. For occasions when you need to enter numbers or text, an alpha-numeric keypad is provided next to the single rotary control, plus there is an on-screen touch sensitive keyboard available. The function of the rotary control is also software defined so it can be used to move markers around the screen, set frequencies, etc. The remaining controls are arranged in functional groups to ease operation.

The main RF input and outputs are fitted with high quality N type sockets with clear warnings on the maximum input levels. Also, on the front panel is a 3.5mm jack for listening to demodulated audio, plus a USB-A socket that's designed to accept USB peripherals such as a memory stick, external hard drive, etc. With a memory stick attached, this can be used to store screen shots and instrument setups. You can also use this socket to attach an external USB hub to connect storage and a standard mouse and keyboard.

Moving onto the rear panel, **Photo 2**, there is a 10/100 Base RJ-45, Ethernet jack along with a USB-B socket. Both were fully populated and are used to support remote control of the instrument. To help ensure accurate and consistent measurements, the SVA-1032X features 10MHz reference in and out sockets. Using these, it's possible to daisy-chain several instruments to the same 10MHz reference signal. The SVA-1032X also has a BNC external trigger connection that accepts a 5V TTL level. This is ideal for synchronising the spectrum analyser sweep to an external event. Finally, the power connection uses a familiar IEC socket and accepts 100-240V AC.

Mike Richards, G4WNC
ptamike@hotmail.com

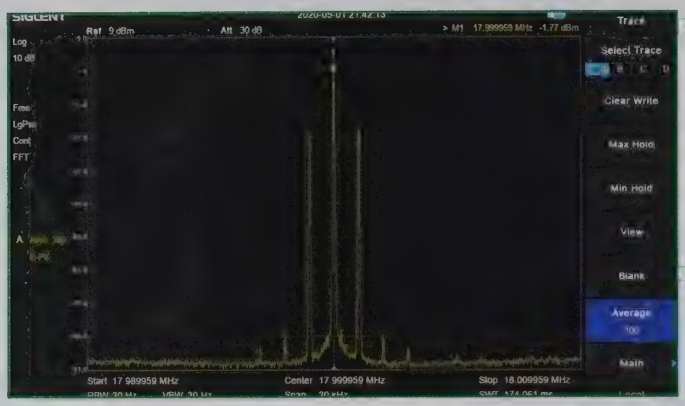


FIGURE 4: Modulated 14MHz carrier with averaging applied to reveal spurious signals.

FIGURE 5: HermesLite-2 transceiver phase noise at 3 watts output.

## Using the spectrum analyser

I have to admit I was looking forward to this review because I had a few ongoing projects where a 3.2GHz spectrum analyser would be very useful. In particular, I wanted to look at the amplifiers and couplers I'm using in the 2.4GHz transmit path for my QO-100 setup. When I first started using the analyser, I found the Auto Tune button particularly helpful. Pressing this starts an automated routine that examines the incoming signal and configures the analyser to properly display the applied signal. This worked extremely well with steady state signals and took around 3 seconds to produce a display, **Figure 2**, ie a peak centred on the display. This was a great time-saver and quick way to get a new signal displayed.

Once the Auto-tune completed, I then trimmed the settings for the best result. I'm sure the Auto Tune will be a big help for those new to spectrum analysers as it gets a signal on the screen with the minimum input from the operator.

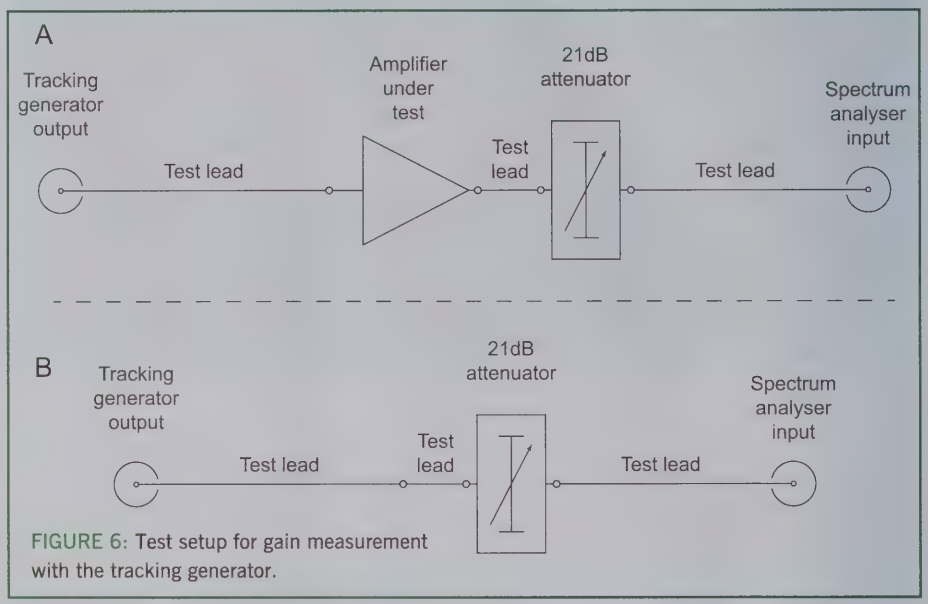


FIGURE 6: Test setup for gain measurement with the tracking generator.

When you have your signal displayed, Siglent have made the analyser particularly easy to fine tune. To the right of the display are the important Frequency, Span and Amplitude controls. These all activate the appropriate soft-buttons by the side of the display. **Photo 3** shows the screen display when the Frequency button is pressed. Here you can see that there are softkeys displayed to set: centre frequency, start frequency, stop frequency, frequency offset, frequency step and automatically move the peak to the centre of the display and more. With each of these options you can set the detailed parameters either using the keypad, rotary knob, USB keyboard, or the on-screen keyboard. I found this to be a convenient way to navigate the analyser's controls.

The Peak-to CF (Centre Frequency) button was particularly helpful when homing in on a signal as it quickly returned the signal back to the centre of the display. For me, the best way to adjust the settings was to use the on-screen touch controls. The touch screen was superb, and the sensitivity was spot-on. Using the Frequency, Scan and Amplitude controls let me quickly home in on a signal and achieve the optimum display. The touch screen also provided easy access to the sampling parameters. By touching the left side of the screen, I could set the important detector and display parameters. As an example, the trace in **Figure 3** shows the 20kHz wide spectrum display of an AM modulated 14MHz carrier. This is using the default sampling and trace settings of Positive Peak and Clear Write respectively. In that display the noise floor could be masking some unwanted components of the displayed signal. By simply changing the trace mode to averaging (100 times), the trace resolves into a much clearer picture of the signal, **Figure 4**. This technique works because the noise element is random and the analyser was previously displaying its peak values. By changing to averaging, the noise element will settle to a lower, more realistic, value and the peaks and troughs will be smoothed out. However, our steady state signal, will remain unaltered by the averaging. The net result is that the steady state signal and its unwanted components emerge above the smoothed noise. A similar effect can be obtained by altering the video bandwidth (VBW). When you adjust the VBW you are changing the width of a filter that's applied after the detector. The SVA-1032X also includes separately adjustable resolution and video bandwidth controls allowing a measurement resolution bandwidth as low as 1Hz. As with all spectrum analysers, reducing the resolution or video bandwidth significantly extends the sweep time.

Once the spectrum parameters have been set and you have the desired display, the SVA-1032X has several tools to aid analysis of the signal. The simplest of which is to use the 8 available markers. Each of the markers can be steered across the display using the rotary control which is rate sensitive. Alternatively, the marker can be dragged into position using the touch screen or a USB mouse. These flexible options made detailed measurements a joy. By default, the

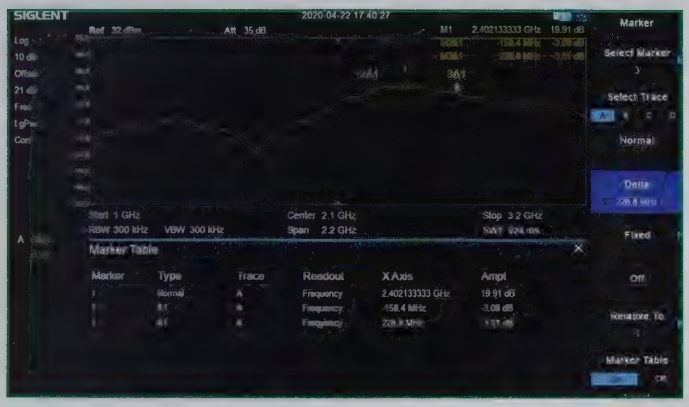


FIGURE 7: 2.4GHz driver amplifier gain showing -3dB points.

measured values at the marker cursors were shown in the top right of the display. However, there was also the option to display the results in tabular form in the lower half of the screen.

In addition to simple markers, the SVA-1032X includes delta markers that allow you to measure the difference between markers This is very helpful for phase noise and similar measurement where you need to place several measurement points at specific spacings from the carrier. When using delta markers, the displayed results become relative to the master marker, which is usually the carrier. In **Figure 5** I've shown a phase noise measurement trace of my Hermes Lite-2 transceiver running just over 3 watts (+35dBm) into a dummy load. To avoid overloading the analyser, I used a 40dB RF tap to extract a sample of RF for the spectrum analyser. You will see that I've placed Marker 1 on the peak whilst the remaining markers are setup as delta markers and spaced at ±1kHz and ±10kHz from the carrier. The measured results for each marker are displayed in tabular form and provide a direct readout of phase noise. To maintain a reasonable sweep speed, the measurement was taken with a 30Hz resolution bandwidth, so the result needs to be normalised to 1Hz. Another useful feature of the SVA-1032X is the ease with which you can save a screen shot. A single press of the Save button and the displayed screen is saved to a memory stick connected to the front panel USB socket. As part of the save process, you have the option to add a custom file name. This is useful for keeping a performance record of your kit. Whilst I've been reviewing the SVA-1032X to test my own kit, I've kept a screen shot of the result from each item for future reference.

## Tracking generator

Whilst the spectrum analyser's main function is to analyse an existing signal, the addition of a tracking generator lets us plot the frequency responses of 2-port RF devices such as filters, amplifiers, etc. As the name suggests, a tracking generator is an adjustable level, RF signal source, that follows the frequency sweep of the spectrum analyser. In the SVA-1032X, the output level is adjustable in 1dB steps from 0dBm to -20dBm. For my first test, I set about checking the response of one of my Analog Devices CN-0417, 2.4GHz amplifiers. These are very neat units with 21dB gain and on-board filtering. When measuring amplifier performance with a spectrum analyser, it's important to take care to protect the sensitive input circuitry.

As I wanted to check the amplifier's performance at full power (+30dBm), I placed an adjustable attenuator set to 21dB between the output of the amplifier and the spectrum analyser input, **Figure 6a**. One of the problems with attempting to make accurate measurements at 2.4GHz and beyond is the impact of the test leads and, in this case, the external attenuator. The SVA-1032X has a neat way around this with their Normalise feature. In much the same way as you null out the resistance of the your multimer leads when measuring resistance,

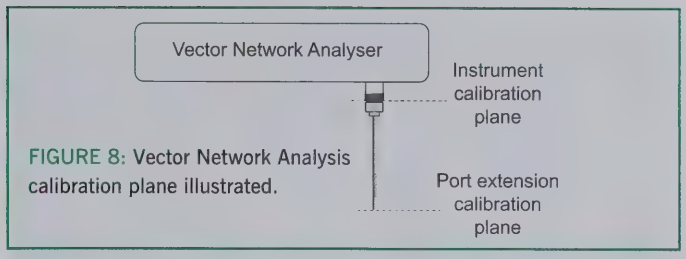


FIGURE 8: Vector Network Analysis calibration plane illustrated.

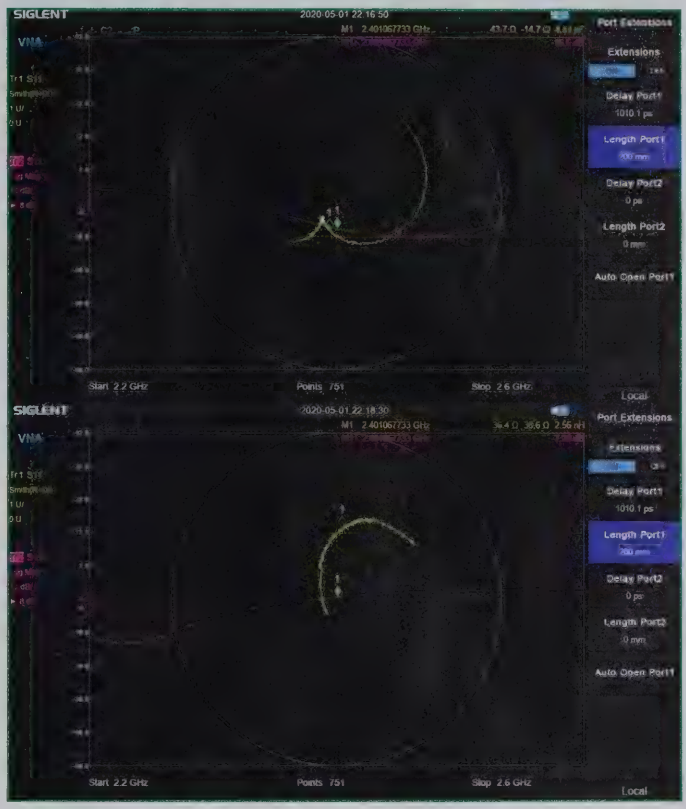


FIGURE 9: 2.4GHz driver amplifier input and output characteristics.

the SVA-1032X's normalise does the same job for RF. Before starting the measurement, I bypassed the amplifer, **Figure 6b**, and stored the result as a reference trace, whereupon the Normalise function automatically subtracted that result from the displayed result. In **Figure 7** you can see that the measured gain at 2.4GHz is 19.43dB.

## Vector network analyser

Up to this point, I've been using the SVA1032X for scalar measurements, ie measuring the amplitude of signals passing through orb omitted by various systems. When it comes to RF measurements, particularly anything to do with antennas, we need more information about the impedance of systems so we can understand all the reactive elements that are in play. The standard tool for this is a Vector Network Analyser (VNA) such as the SVA-1032X. In VNA mode the SVA-1032X covers 100kHz through to 3.2GHz with up to 751 sample points per scan.

Before starting any measurements with a VNA, we need to consider the connection between the VNA and Device Under Test (DUT). This is especially important at higher frequencies, where the test connections may significantly impact the results. VNAs have a neat solution to this problem. In much the same was as I normalised or cancelled out the effect of the test leads earlier, we can do the same with the VNA. However, because we're making vector measurements, we use a three or four step calibration process. The three-step process,

FIGURE 10: 2.4GHz driver amplifier s21 and s11 measurements.

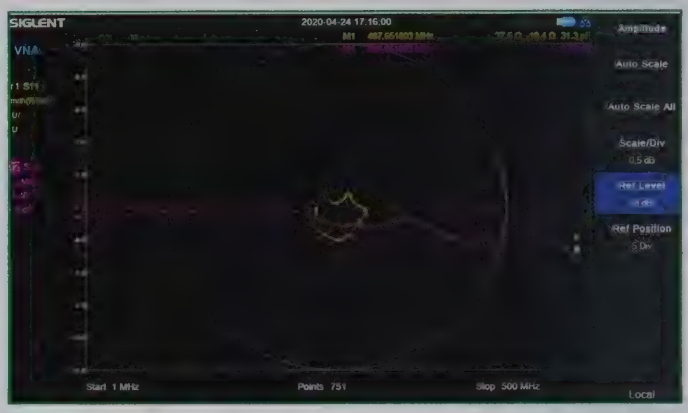


FIGURE 11: Siglent SVA-1032X web interface screenshot.

often referred to as SOL (Short, Open, Load) requires first connecting a short circuit to the test point followed by an open circuit and then a calibrated load. The fourth step, where Port 1 and 2 are connected, is only used for through measurements. At each calibration step, the VNA completes a sweep and stores the result. At the end of the calibration, the VNA calculates the test lead parameters and these are subtracted from subsequent measurements. The point at which the calibration is completed is critical and is known as the calibration plane. I've illustrated this in **Figure 8**. The quality of the calibration kit clearly has a bearing on the accuracy of the VNA measurements, so it's important to use an appropriate kit. You can pay considerable sums for calibration kits, but this is not always justified. For general LF through to HF work you can find perfectly adequate calibration kits for less that £60. However, when you move into microwave frequencies you may need to spend several hundred pounds for the best kits. The SVA-1032X has custom settings for three popular calibration kits plus user memories for two more kits. An alternative solution is to rely on the default instrument calibration and make use of the port extension settings to define the characteristics of the test leads. The SVA-1032X includes port extension facilities where you can specify the cable length and delay. The calibration process on the SVA-1032X only took a few minutes to complete, so was easy to apply.

The 's' (scattering) parameters are a common way of representing vector network parameters. The SVA-1032X is essentially a single port VNA with a reflectometer connected to Port 1 so it can measure the complex impedance at that port (s11). Port 2 can also be used for measurement but only to measure the through values (s21) on 2-port devices such as amplifiers, filters, etc.

The first item up for examination was the Analog Devices CN0417, 2.4GHz amplifier. I wanted to use the SVA-1032X to examine the amplifier's input and output impedance. As this amplifier has SMA input and output connectors, I used my SMA calibration set at the end of my test leads to move the calibration plane. I could have achieved a similar result by using the port extensions facility. To make the measurement, the amplifier input was connected to port 1 of the SVA-1032X and a terminating load connected to the output and the amplifier powered up. In this case I was only interested in the performance at 2.4GHz, so I used a narrow sweep width.

To measure the output impedance, I simply swapped the amplifier around so that the output was connected to Port 1. I've shown the resulting plots in **Figure 9a** and **b**. I also took the opportunity to measure the input impedance (s11) and the amplifier gain (s21) by connecting the output directly to Port 2 of the analyser. This was safe to do because this was a low power amplifier. If it had been a more powerful amplifier, I would have used a power attenuator in the output or a dummy load with a calibrated power take-off. I've shown a plot of the combined amplifier gain (s21) and input impedance (s11) in **Figure 10**. As you can see, this makes use of the multiple traces available with the SVA-1032X. The green plot shows the amplifier gain whilst the violet plot shows the input impedance on a Smith chart.

## Remote control

The SVA-1032X is supplied with a full range of connectivity options and supports SCPI (Simple Commands for Programmable Instruments) commands via the Ethernet or USB interfaces. For those that require a GPIB connection that is also available as an option. During the review, I used the Keysight Connection Expert to access the SVA-1032X and I was able to control the instrument without issue. I also use Python scripts with the PyVisa library to control my own test equipment and this worked well with the SVA-1032X. Those that require SCPI control will also appreciate the downloadable, 154-page, programming manual. For occasional remote control, the integrated web server is an excellent option. All you need is an Ethernet connection to your local network and you can take control of the SVA-1032X using a standard web browser. **Figure 11** shows a screenshot of the SVA-1032X webserver interface in full-screen mode. Siglent also provide the free, Easy Spectrum, software but control is limited to the spectrum analyser. Overall, this is an excellent range of remote access options.

## Specialist measurements

For those that are considering using the SVA-1032X in a commercial testing setup, Siglent have several measurements options available. These include distance to fault analysis, modulation analysis (digital and analogue) and EMI analysis.

## Summary

The SVA-1032X is an impressive spectrum and vector network analyser that's remarkably easy to use. As with all sophisticated test equipment, you do need to spend time to understand the measurement system, but the Auto Tune feature of the spectrum analyser was a particularly helpful way to get to a good starting point. The 10.1" screen is the star of the piece as it provides an excellent view of the measurement results and the touchscreen control was superb. The SVA1032X would be a great asset for any RF experimenter and a useful investment for a radio club. In addition to the SVA-1032X revewed here, the Siglent range includes a number of spectrum analysers to suit different budgets and it's worth looking through the choices for the instrument that's best for you.

The SVA-1032X Spectrum and Vector Network Analyser reviewed here is available from Labtronix (labtronix.co.uk) and costs £3,238 whilst the F503EB calibration kit costs £363. My thanks to Labtronix for the loan of the review model.

RadCom

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# HF F-Layer Propagation Predictions for July 2020

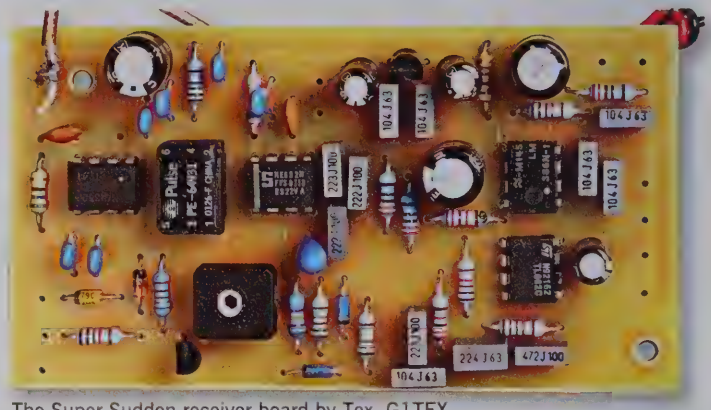
## Compiled by Gwyn Williams, G4FKH

| Time (UTC) | 3.5MHz 000011111220 246802468020 | 7.0MHz 000011111220 246802468020 | 10.1MHz 000011111220 246802468020 | 14.0MHz 000011111220 246802468020 | 18.1MHz 000011111220 246802468020 | 21.0MHz 000011111220 246802468020 | 24.9MHz 000011111220 246802468020 | 28.0MHz 000011111220 246802468020 |
|---|---|---|---|---|---|---|---|---|
| *** Europe | | | | | | | | |
| Moscow | 86.....89 | 87654...6788 | 477554446775 | .3446434774. | ..2222.2332. | ....1...22.. | ..... | ..... |
| *** Asia | | | | | | | | |
| Yakutsk | ..... | 43.43.343444 | .33443443443 | ..... | ..... | ..... | ..... | ..... |
| Tokyo | ..... | ..... | .....3.. | ..... | ..... | ..... | ..... | ..... |
| Singapore | ..... | .....4 | ..... | ..... | ..... | ..... | ..... | ..... |
| Hyderabad | .....6 | 4.....666 | .....4553 | ..... | ..... | ..... | ..... | ..... |
| Tel Aviv | 97.....88 | 775.....5788 | .5643.456774 | ..4332.3662. | .....22.. | ..... | ..... | ..... |
| *** Oceania | | | | | | | | |
| Wellington | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Well (ZL) (LP) | ..... | 554.....365 | 44.....55 | .....43 | ..... | ..... | ..... | ..... |
| Perth | .....5 | .....55.5 | .....33.4 | ..... | ..... | ..... | ..... | ..... |
| Sydney | ..... | .....56.. | .....3443. | ..... | ..... | ..... | ..... | ..... |
| Melbourne (LP) | ..... | 445..... | 3.4.....3 | .....2 | ..... | ..... | ..... | ..... |
| Honolulu | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Honolulu (LP) | ..... | ..... | ..... | .....2... | .....2... | ..... | ..... | ..... |
| W. Samoa | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| *** Africa | | | | | | | | |
| Mauritius | .....5 | .....554. | .....3... | ..... | ..... | ..... | ..... | ..... |
| Johannesburg | .5..... | .....54.. | .....4... | ..... | ..... | ..... | ..... | ..... |
| Ibadan | 887.....88 | 7774.....777 | 4.7533..5765 | ..45333356.. | ...2....34.. | .....2.. | ..... | ..... |
| Nairobi | 77.....77 | .63.....676 | .34.....564. | ..2.3...53.. | .....2... | ..... | ..... | ..... |
| Canary Isles | 998.....599 | 88764...4788 | 54765444 5788 | 2.4734446774 | ..2433324732 | ...22221242. | ...11...12.. | .....1.. |
| *** S. America | | | | | | | | |
| Buenos Aires | ..... | 555.....56 | ..3.....55 | .....342 | .....2.. | ..... | ..... | ..... |
| Rio de Janeiro | 66.....6 | 65.....67 | 3.....465 | .....442 | .....32. | .....2.. | ..... | ..... |
| Lima | ..... | 556.....46 | ..3.....44 | .....3. | ..... | ..... | ..... | ..... |
| Caracas | ..... | 666.....6 | .....5 | .....4. | ..... | ..... | ..... | ..... |
| *** N. America | | | | | | | | |
| Guatemala | ..... | 555..... | .....4 | ..... | ..... | ..... | ..... | ..... |
| New Orleans | ..... | 56..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Washington | 77..... | 77654..... | ....433...45 | .....4. | ..... | ..... | ..... | ..... |
| Quebec | 77..... | 6665.....5 | ....3333..44 | .....2. | ..... | ..... | ..... | ..... |
| Anchorage | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Vancouver | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| San Francisco | ..... | .55..... | ..3..... | ..... | ..... | ..... | ..... | ..... |
| San Fran (LP) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

Key: The figures represent approximate S-meter readings, whilst the colours represent expected circuit reliability. **Black** equals low to very low probability, **Blue** equals good probability and **Red** equals a strong probability. No signal is expected when a '.' is shown. The RSGB Propagation Studies Committee provides propagation predictions on the internet at www.rsgb.org.uk/propagation/index.php. An input power of 100W and a dipole aerial has been used in the preparation of these predictions; therefore a better equipped station should expect better results. The predicted smoothed sunspot numbers for July, August & September are respectively (SIDC classical method – Waldmeier's standard) 5, 5 & 6 and (combined method) 18, 20 & 24. The provisional mean sunspot number for May was 0.2. The daily maximum / minimum numbers were 4 on 1 May and 0 on 2-30 May.

# QRP – news from the G-QRP Club

Leslie, G0NMD, with his Shack on a Pole.



The Super Sudden receiver board by Tex, G1TEX.

**For over forty years the G-QRP Club has awarded a variety of trophies for the best articles published in the Club's journal *SPRAT*, for operating achievements and for contributions to the international QRP community.**

This year's awards were announced recently and I thought it would be useful for the achievements to be celebrated via *RadCom* to give due recognition to those who were successful and to allow non-members to see what the Club gets up to.

Our oldest trophy, the G2NJ trophy, was first awarded in 1976 and can be awarded for the best technical article in SPRAT, or for a most outstanding contribution to the international QRP community. This year it was awarded to Tex Swann, G1TEX, for his article on the Super Sudden Receiver. This was an update and upgrade on the famous direct conversion receiver designed in the 1980s by G3RJV. Tex added two more ICs to provide additional RF gain and AF filtering. Used with a set of band pass filters and a DDS signal source, the Super Sudden makes a very capable multi-band receiver.

The **Partridge Trophy** is awarded for the best antenna article and this year it has been awarded to John Leonardelli, VE3IPS for his work on 'The Misunderstood T2FD'. The Tilted Terminated Folded Dipole antenna has been around for many years and continues to attract interest, despite it being written off by many. There are a number of commercial versions around and a very useful description of how to build one in the RSGB book *Practical Wire Antennas 2*. John's article took us through his experience of building and using one and concludes that it is a very useful antenna with a low noise level. Other members have since reported similar findings.

The best practical article in SPRAT receives the **Gordon Bennet Trophy;** Gordon, G3DNF was the Club's first Chairman and is credited with naming the Journal SPRAT, short for Small Powered Radio Amateur Transmission. This year the trophy has been awarded to Leslie Austin, G0NMD, for his article 'Shack on a Pole', which described a portable set up with a small operating 'table' fixed to an antenna support. Leslie notes that whilst it 'would not support an RA17L it copes very well with a KX3, a note pad and a Palm Paddle key'.

Simple articles are always popular with members and the best one receives the **W1FB Trophy**, awarded in memory of the doyen of QRP, Doug DeMaw. This year it has been awarded to David Smith, G4COE for his 'Ossy Box' crystal tester, a simple little circuit you can take to a rally and check those 'junk' crystals before you part with your hard-earned cash.

The Winter Sports is one of the Club's most popular activity periods, running annually between Christmas and New Year. The best log wins the **G4DQP Trophy** and for 2019 that was received from Peter Barville, G3XJS who was active on several bands. Peter has also re-joined the Club's officers as the Communications Manager, so he will be our representative at the RSGB Spectrum Forum. A note of thanks must be recorded to Dom Baines, M1KTA, who had held the position since the Winter of 2012.

The **Chelmsley Trophy** is awarded for the best log covering the whole of each year, and at a time of minimal sunspots, working *anything* can be a challenge. For the second year in a row, the winner is Carl Mason, GW0VSW, and his log proves that you can still work with QRP even when propagation is not overly helpful. Carl made over 1400 QRP contacts in 2019, mostly using his Xiego G90 SDR transceiver putting four watts into an inverted V antenna. He bagged 65 DXCC entities with CW and 47 with SSB.

Each year the RSGB awards the **G4STT Trophy** for outstanding service to QRP. Whilst the trophy is awarded by the RSGB, the G-QRP have some say in who is nominated. This year it was Colin, G3VTT, whose name was added to the honour roll. Colin has been working behind the scenes of the G-QRP Club for many years, he writes the Vales and Vintage column in SPRAT and runs regular Valve activity days for the members.

And finally, Jo-Anna Dobbs, G0OWH, widow of George, G3RJV, has asked that we remember our founder through a new Club trophy, the **G3RJV Memorial Trophy.** After some consideration, it has been decided that this will be awarded for QRP construction; could there be a more appropriate way to remember such an avid radio constructor? So, the rules are very simple, Club members are to bring, or send, one of their QRP projects, made in the last year, to the Club Convention at Telford and the project deemed to be 'best in show' will win the trophy. The term 'best' is open to interpretation by the judges and could be for technical innovation, construction skill, or some other element of charm. Projects must come with a circuit and a bit of explanation, and it must work. Postal entries will be returned in their packaging they arrived in. As I write this, we cannot know if the Telford Convention will go ahead in September 2020 but we live in hope.

If you are not a member of the G-QRP Club, I hope this little overview has provided an insight into what goes on for those devoted to low power communications. Details of how to join can be found on our website www.gqrp.com/memb.htm.

**Steve Hartley, G0FUW, Chairman**
g0fuw@gqrp.co.uk

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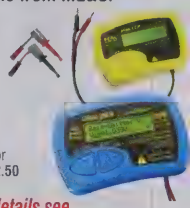

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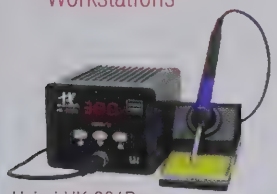
Fast heating T12 soldering station.



ML&S PRICE: **JUST £74.95**

### Hairui 936D+

Entry level Desk top solder station. Digital display with variable temperature.

ML&S PRICE **JUST £39.95**

### HAIRUI 863D

Three-in-one re-workstation. Blower gun for SMD rework, separate soldering iron, auto-shut-off to protect heating element.

ML&S PRICE: **JUST £104.95**

***For the full range see www. HamRadio.co.uk/HAIRUI***

## West Mountain RADIO

ML&S are the sole distributor for West Mountain radio products!

***The full range of RIGblasters, RIGrunners, PowerPoles and Battery Analysers are available.***

### *RIGblaster*

The easiest way to properly connect your radio to a computer so that you may operate using over 100 existing and future ham radio sound card software programs. You will be able to operate any sound-card based digital mode that your radio could not otherwise operate.

### *RIGrunners*

RIGrunner product line offers the most convenient and safest way to connect all your 12 VDC equipment to a power source. RIGrunner utilizes a 13.8 VDC power panel with simple-to-use Anderson Powerpole® connectors. Standardize all of your 12 VDC connections using the amateur radio ARES & RACES. RSGB. ARRL Powerpole® system.

### *DC Power Products*

Power management devices to protect both the radio equipment and the power systems they are connected to. These devices provide both battery charge management and load management features.

***www.HamRadio.co.uk/ westmountainradio***

## ML&S Appointed Sole UK Distributor for CW Morse Keys!

There are over 35 different keys to choose from including Camel Back, Straight Keys, Micro Keys, Lightweight Keys, Heavy Duty Keys, Paddle Keys, Navy Keys & even Bullseye Keys. With such a huge & colourful range to choose from there's bound to be a model (or two!) to suit CW enthusiasts worldwide.

ML&S PRICE **FROM ONLY £19.95**

***For more information see www.HamRadio.co.uk/CWMorse***

## Wouxun KG-UV9K Pro Pack

**New version of the ever popular UV9D - the UV9K! Now with 8.33 step.**

- KG-UV9K Transceiver
- Two batteries
- Two belt-clips
- Software and transfer data cable
- Fast charger dock and Power Supply
- Hand speaker mic
- Battery eliminator
- Manual
- Wrist strap
- Leather case
- In-car charger
- SMA-PL259 adaptor
- Hands-Free kit

ML&S PRICE: **ALL THIS FOR JUST £144.95**

## WOUXUN

WOUXUN KG-UV980PL

Up to 50W (band dependent). Unique Quadband mobile/base from Wouxun. Bands covered are 4m / 6m / 2m / 70cm.

***Includes FREE programming software.***

ML&S PRICE: **JUST £289.95**

## AnyTone

Anytone AT-778VU

**30W 250 mems, full feature.**

ML&S PRICE **ONLY £89.95**

**Including programming cable.**

## RADIO TONE RT4 4G INTERNET TRANSCEIVER

**Large Screen & fully compatible with Zello PTT, International Radio Network & Echolink.**

RRP: £299.95

ML&S PRICE: **ONLY £174.95**

***www.HamRadio.co.uk/RT4***

ML&S RAPID DELIVERY VEHICLE

**You can now order from ML&S for delivery on a Saturday or Sunday!**
Order before 2pm as late as Friday of each week and see it delivered at the weekend.

**Web purchases:**
Just select Saturday or Sunday at the check-out.
Or call to place your order for Saturday or Sunday delivery on **0345 2300 599**

FAST DPD

FOLLOW US ON TWITTER AND FACEBOOK HamRadioUK

# ML&S are No.1 for Power Supplies, Headsets & Accessories

**Two-year warranty on all MyDEL PSUs**

## Nissei DG-503
**Digital Power Meter**

ML&S **ONLY £109.95**

**Main Features:**
- ✔ Large LCD (3") display for ease of reading
- ✔ Forward power / Reflected power / VSWR ration
- ✔ LCD backlit display for ease of reading
- ✔ Convenient control layout for ease operation
- ✔ Packing gift box and micro-usb cable
- ✔ 1.6-60MHz + 125-512MHz, 200W.

## New NS-1230D
**Now with Power Poles!**

Latest mini-30AMP 13.8V DC Power supply from Nissei, digital readout. **As featured on MLandS.TV channel, August 2018**

ML&S: **ONLY £94.95**

## Nissei RS-50 & RS-70 compact in-line meters

The RS-50 (120W 2m & 70cm) & 70 (200W 160m-6m) are compact in-line meters that present power and SWR on a digital backlit LCD display.

ML&S: **ONLY £69.95 EACH**

FOR MORE INFORMATION CLICK **WWW.HAMRADIO.CO.UK/NISSEI**

## Heil Sound

**ML&S ARE THE OFFICIAL UK IMPORTER FOR HEIL SOUND**

Click! *www.HamRadio.co.uk/heil*

| | |
|---|---|
| Pro-Set 7 | £239.95 |
| Pro-Set 6 | £129.95 |
| Pro-Set IC | £162.95 |
| Pro-Set Elite 6 | £174.95 |
| Pro-Set Elite IC | £189.95 |
| Pro-Set 3 Headphones | £109.95 |
| PR-781 Microphone | £189.95 |
| PR-40 Microphone | From £299.95 |

## New! Heil PRAS Parametric Receive Audio System

*Totally enhance, modify, shape, and improve the audio output of your receivers or transceivers using three separate equalization controls. Supplied with Powered Speaker using a 24 Watt Class-A Amplifier.*

ML&S **IN STOCK £349.95**

## Daiwa Meters

**NEW Diawa meters in stock now.**
*See: www.HamRadio.co.uk/daiwa*

**All featuring cross needle display offering unrivalled accuracy for SWR & Power**

| | |
|---|---|
| CN-501H/VN/H2 SWR/PowerMeter | From £99.99 |
| CN-103LN 140-525MHz. 20/200W. N-Type | £99.95 |
| CN-901HP 1.8-200MHz. 20/200/2kW. PEP Reading. Large display | £144.95 |
| CN-901HP3 1.8-200MHz. 30/300/3kW. PEP Reading. Large display | £179.95 |
| CN-901VN 140-525MHz. 20/200W. N-Type | £119.95 |

## MyDEL POWER SUPPLIES

### MyDEL MP-30SW1V
**£89.95**

25Amps, 9-15V DC, super light with digital metering for Volts & Amps.

### MyDEL MP-60SW111
**£149.95**

60 Amp version of the MP-30SW1V. 60 Amp DC power supply.

### MyDEL MP-304MkII **£99.95**
**Heavy Duty LINEAR 30Amp**

Non-switching linear power supply with huge chassis mounted transformer (old style!)

FOR MORE INFORMATION CLICK **WWW.HAMRADIO.CO.UK**

## CG-PK4 Pocket Keyer

**CG Antenna introduce the new pocket Electronic Memory Keyer.**

- Extremely small size
- Very low power consumption (160MicroAmps)
- Four memories with Auto Repeat function
- Selectable Keying Weight
- Built-in side tone ideal for training
- Keying speed 8-50WPM
- Advanced Paddle Mode
- Straight Keyer Mode

ML&S: **ONLY £44.95**

## Yaesu YA-30

ML&S: **ONLY £199.95**

*Click: www.HamRadio.co.uk/ya30*

*The Yaesu YA-30 is very simple to use. Just open the box, roll out the antenna outside where you want to erect. Snap in the supplied spreaders, connect the high quality coax cable assembly (terminated with PL-259's so you don't even have to fit any plugs).*

## DX Accessories

**For more information, prices & technical information email MicroHam@HamRadio.uk**

**microHAM**

**For the complete range of Array Solutions and microHAM**

*www.HamRadio.co.uk/arraysolutions or /microham*

**DX ENGINEERING**

**DX Engineering are an American manufacturing company that specialises in Antenna Hardware built to the highest quality. Their product range is so huge the entire list would fill this magazine.**

*Call us or check out www.HamRadio.co.uk/dxengineering*

Full range of Messi & Paoloni Low Loss Professional Coaxial Cable in stock now!

**M&P ExtraFlex Bury**
10.3mm / 0.405in Cable. **£3.29**

**M&P ULTRAFLEX 7**
Better than RG213 but near to the size of Mini 8. **£1.50**

**M&P ULTRAFLEX 10**
10.3mm LowLoss cable, 50 Ohm, "alternative for RG-213."

**All of our cables can be ordered by the metre. There is a 10% discount for 100m+.**

## Radiosport Headsets

Whether for DXing, contesting, field day, or casual everyday use we think you'll agree Radiosport headsets have the features you want. ML&S are proud to have been appointed their distributor and have stock today. **All headsets are supplied with GEL Cushions giving extra comfort and FREE cloth covers.**

**RS1OSL**
Listen only stereo lightweight headset for CW ops..... **£109.95**

**RS60CF**
Deluxe Dream Edition Stereo Headset with boom..... **£239.95**

**RS20S**
Deluxe Dream Edition Stereo Headset only no boom..... **£169.95**

**Mini-XLR**
Lead set for any radio (Yaesu/Kenwood/Icom/Flex/Elecraft)..... **from £69.95**

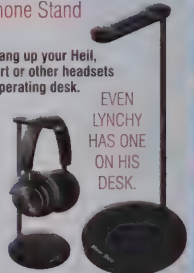
**PTT-FS-RCA** Foot switch with 7ft cable with phono plug..... **£50.95**

**PPT-HS-RCA** Hand PTT Switch, 7 foot cable with phono plug..... **£64.95**

**How about an additional 3.5mm socket on the opposite ear cup to allow "tethering" of another headset for a logger or maybe just an additional pair of ears?**

*www.HamRadio.co.uk/radiosport*

## MyDEL Headphone Stand



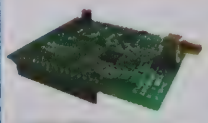
**Ideal to hang up your Heil, RadioSport or other headsets on your operating desk.**

EVEN LYNCHY HAS ONE ON HIS DESK.

**Made of aluminium alloy, with a cushioned rubber part to prevent the headphones from slipping.**

ML&S: **ONLY £7.95**

## ML&S are the sole UK distributors for the **DV Mega Range** of products



**DVMEGA is a collective name for digital voice and data related kits and modules. C4FM, DMR and D-STAR is supported with more digital voice and data modes added all the time.**

**DV Dualband (VHF/UHF) radio shield**
This shield is compatible with Arduino UNO or MEGA. This module has a 10mW UHF and VHF transceiver on board. In combination with an Arduino you make your own stand-alone dual band hot spot. This module, together with the AMBE3000 forms the basis for a self-assembly D-Star kit transceiver.

**DVMEGA Cast** is a AMBE3000 based Multimode IP radio for DMR, D-Star and Fusion. The DVMEGA Cast is compatible with Ham radio networks like BrandMeister, DMR+, YSF, FSC, REF, XRF, XLX, DSC etc. **£319.95**

## Tigertronics SL-USB

ALL sound card Digital and voice modes are supported by the SignaLinkTM USB. This includes traditional modes such as RTTY, SSTV and CW (to name a few), as well as today's hottest new modes like PSK31, FT-8 and WSPR.

ML&S: **ONLY £99.95**

**Buy with your required lead and get a discount off the bundle price.**

*www.HamRadio.co.uk/tigertronics*

## Coax Cable Strippers

**DXE-UT-8213**
This tool prepares RG-8, RG-213, 9913F7, LMR-400 (not LMR-400UF) and other similar size coax cable for installation of a PL-259 connector.

ML&S: **ONLY £74.95**

**DXE-15035**
Great for everything from RG-58 up to Ultraflex 10! Designed for stripping RG-8, RG-213, 400MAX, and similar size cable. Simple to operate, they are preset.

ML&S: **ONLY £23.95**

**ML&S 0345 2300 599**

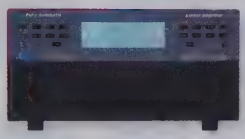
**You can now order from ML&S for delivery on a Saturday or Sunday!**
Order before 2pm as late as Friday of each week and see it delivered at the weekend.

MARTIN LYNCH & SONS LTD. THE WORLD'S FAVOURITE HAMSTORE

# ML&S are No.1 for Tuners, Linear Amps, Dummy Loads, Antennas & Accessories

## LINEAR AMPLIFIERS IN STOCK TODAY

### SPE Expert 2K-FA



- 2kW PEP/CW 1.8-55MHz
- Built-in Auto ATU & PSU
- 35W drive required
- Fully Remotable
- 6-way antenna switch

**ONLY £5149.95**

### Juma PA1000

- 1kW 1kW PEP/CW 1.8-55MHz
- Built-in PSUUltra-Lightweight, just 12lbs (5.5kg)
- 5-25W drive required

**ONLY £2795.95**

### Acom 1000

- 1kW 1kW PEP/CW 1.8-55MHz
- Single 4CX800A (GU74) Valve PA
- Built-in PSU
- 50-60W drive required

**ONLY £2299.95**

### Acom 700S

- Five inch (108 x 65mm) high resolution colour display, 800 x 480 pixels and 24-bit colour.
- Compatible with all transceiver models available on the market - does not need any special signals: "ground on transmit" (PTT) and 40W of RF drive power is sufficient.
- Broadband input circuit providing a perfect transceiver load with SWR below 1.2:1 (typically 1.1:1), without retuning throughout the whole frequency range from 1.8 to 54MHz.
- The overall operation of ACOM 700S is extremely simplified: the screen menus are intuitive and easy to follow and no special skill is required from the operator when changing frequency bands.
- Possibility of automatic control – when connected to a transceiver with a CAT interface.
- Convenient for expeditions and field operation: extremely compact and light construction.

**ONLY £2599.96**

### Acom 1200S

**Same as 700S but with 1kW output**

**ONLY £2749.95**

*Full selection of amplifiers available see HamRadio.co.uk/amplifiers*

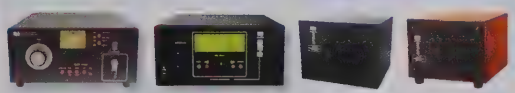
## MetroVNA-180 & 250 Antenna Analysers

Both available from stock, Large clear 16k touch-screen display, Internal Battery, BlueTooth, either 100kHz-180 or 250MHz, Win10 or MAC or Android interface.

METROVNA-180: **£269.95** 250 VERSION: **£289.95**

*see www.HamRadio.co.uk/MetroVNA*

## PALSTAR ATUs



*see www.HamRadio.co.uk/palstar*

| | | |
|---|---|---|
| **New SP-30B/C** | Real wooden enclosure housing speaker. Available in Cherry or Black | £129.95 |
| **New SP-30H** | Huge real wood enclosure housing speaker. Available in Cherry or Black | £197.95 |
| **HF-Auto** | 1.5kW PEP fully automatic ATU for QRO | £1699.00 |
| **AT-500** | 600W PEP Antenna Tuner | £569.95 |
| **AT-2K** | 2000W PEP Antenna Tuner | £649.95 |
| **AT-2KD** | Differential 2kW PEP Antenna Tuner | £624.95 |
| **AT-4K** | 2.5kW PEP Antenna Tuner | £1149.95 |
| **AT-5K** | 3.5kW PEP Antenna Tuner | £1349.95 |
| **BT-1500A** | Balanced Antenna Tuner | £919.95 |
| **PM-2000AM** | Power/SWR Meter | £249.95 |
| **PM-2000A** | Base Power/SWR Meter | £189.95 |

### Palstar Dummy Loads

**DL-1500** (1.5KW) **DL-2K** (2kW) **DL-5K** (5kW) **See web for prices.**

## MFJ PRODUCTS

| | | |
|---|---|---|
| **MFJ-939** | Plug & Play 200W ATU, you won't even know it's there! | £179.95 |
| **MFJ-974HB** | Manual ATU for balanced line antennas, 160-10m | £249.95 |
| **MFJ-974** | as above but without 160m | £234.95 |
| **MFJ-16010** | Random Wire ATU 160-10M | £93.95 |
| **MFJ-949E** | Manual ATU metered, Dummy Load, 1.8-30MHz, 300W | £209.95 |
| **MFJ-901B** | Manual Mini ATU 1.8-30MHz, 200W | £99.95 |
| **MFJ-971** | Manual ATU metered, 1.8-30MHz, 200W | £154.95 |
| **MFJ-904H** | Manual ATU, metered, inc balanced, 1.8-30MHz 150W | £184.95 |
| **MFJ-969** | Manual Roller ATU Metered 1.8-54MHz, 300W | £269.95 |
| **MFJ-993B** | Auto ATU Metered 1.8-30MHz, 300W | £299.95 |
| **MFJ-1786X** | Magnetic Loop 10-30MHz, 150W re-built & re-aligned by ML&S | £699.95 |
| **MFJ-1788X** | Magnetic Loop 7-22MHz, 150W re-built & re-aligned by ML&S | £749.95 |
| **MFJ-259D** | Antenna Analyser 530kHz-230MHz | £319.95 |
| **MFJ-269C** | 530KHz-230MHz, 415-470MHz Analyser | £369.95 |
| **MFJ-260C** | Dummy Load 300W SO-239 | £52.95 |

**Lots more MFJ stocked! See www.HamRadio.co.uk/mfj**

### SARK-110-ULM Antenna Analyser

The SARK-110-ULM is the entry-level model of the SARK-110 antenna analyser series. This is a truly pocket-size device, so you can take it anywhere. The built-in battery lasts up to eight hours on a single charge. It features a graphical display and an intuitive user interface that makes it easy to operate.

ML&S: **ONLY £199.95.**

### MyDEL Sark110 Vector Impedance Antenna Analyser

Pocket-sized Antenna Analyser providing fast and accurate measurement of vector impedance, VSWR, vector reflection coefficient, return loss, and R-L-C (as series or parallel equivalent circuits). Typical applications include checking and tuning antennas, impedance matching, component test, cable fault location, measuring coaxial cable losses, and cutting coaxial cables to precise electrical lengths.

*see www.HamRadio.co.uk/sark110*

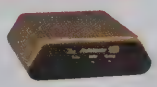
ML&S: **ONLY £349.95**

## LDG ELECTRONICS

*ML&S have the largest stock of LDG outside the US.*

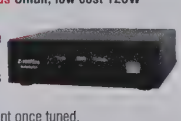
**LDG YT-1200 for Yaesu Transcribers** Auto-ATU for Yaesu FT-450, FT-450D, FT-950, FT-991, FT-991A, FTDX-1200 and FTDX-3000. Only £244.95 Also available LDG YT-100 as above but for FT857, FT897 and FT-100. **Only £179.95**

**LDG Z-817 Auto Tuner for the FT-817/ND** Seamless control via CAT Port of 817. Internal battery tray for portable use. 100mW-20W SSB&CW, 5W for data. **Only £139.95**



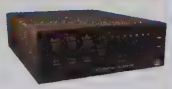
**LDG IT-100 for Icom Transceivers** Auto-ATU for ALL Icom 100W Transceivers. **Only £189.95**

**LDG Z-100Plus Small, low cost 125W Auto ATU.** Will tune from only 100mW of drive & has almost zero standby current once tuned. **Only £169.95**



**LDG Z11Pro11** Portable version of the Z-100 with its own internal battery tray & manual controls for fine-tuning for using outdoor portable operation. **Only £189.95**

**AT-100Pro11** General Purpose tuner with Bar Graph LED readout showing power/SWR status. Will tune from only 1W and handle 125W SSB/CW. Manual tuning capability. **Only £249.95**



**AT-200ProII** As above with 200W RF power handling. Ideal for TS-990, FTdx5000, IC-7851 etc. **Only £279.95**

**AT-600ProII** As above with 600W RF power handling. Perfect for legal UK limit power amplifiers. (There must be some out there). **Only £394.95**

**AT-1000Pro11** As 600ProII with 1kW RF power SSB or 500W data. **Only £529.95**

**LDG RT/RC-100** Weatherproofed Remote Auto-Tuner with shack controller. Powered via the coax feedline & built-in frequency sensor. Only £259.95. 600W version. **£439.95**

### LDG Accessories

**LDG RBA-1:11:1** 200W PEP 1.8-30MHz. Current Balun allowing ladder or end-fed wires to be used with any 100W LDG Tuner or stand-alone. **Only £30.00**

**ML&S ARE THE SOLE WORLDWIDE DISTRIBUTOR FOR ALL LDG PRODUCTS**

**LDG Auto Tuners are intelligent and designed from the start to work seamlessly with your radio. Press the Tune Button and the rig and the tuner will do the rest; reduces power, transmits a carrier, automatically matches the antenna to the rig, then restores the original power and mode.**

## RF Explorer 3G Combo Hand Held Spectrum Analyser

RF Explorer will display full frequency spectrum in the band, including carrier and modulated shape, it will display Spread Spectrum activity, if that exists, and will show bandwidth to monitor collisions, frequency deviation from expected tone, etc.

ML&S: **ONLY £189.95**

***See www.HamRadio.co.uk/rfexplorer***

## RF Explorer WSUB1G+ Spectrum Analyser

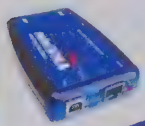
RF Explorer WSUB1G+ is a powerful, high performance digital spectrum analyser covering the 1GHz frequency range starting at 50KHz.
The new SLIM model offers an outstanding robust design, a more convenient USB connector on the side and larger internal battery capacity.

ML&S: **ONLY £169.95**

***See HamRadio.co.uk/wsub1g***

## mRS MiniVNA Antenna Analysers

Perfect for checking antennas and RF circuits for hams and commercial users.



*see www.HamRadio.co.uk/minivna*

**MiniVNA Pro 2** with Bluetooth 100kHz-200MHz..... **£379.95**

**MiniVNA Tiny** Huge coverage, 1MHz-3GHz, Android controllable..... **£429.95**

## AlexLoop www.alexloop.com NEW! ALEX LOOPS

**ML&S is now a UK distributor for AlexLoop.**

**Buy with confidence from ML&S. Small HF loops that work!**

**AlexLoop Premier With Mono block Gold Plated Connectors**
The small portable HF loop that simply works. Get on 40-10m where ever you are. The perfect addition to an FT-817/818 or the highly anticipated IC-705.

**AlexLoop Premier With Mono block Gold Plated Connectors with built-in AlexTune**
As above, but with added device which makes tuning as easy as turning on a light.

**AlexTune (clip on)**
Universal accessory that can be used on the AlexLoop . Already own the AlexLoop? Add the AlexTune to complete the package.

See HamRadio.co.uk/alexloop

# ML&S are No.1 for Antennas & Accessories

## 0345 2300 599. See www.HamRadio.co.uk

NEW PRODUCT

### NEW! DX COMMANDER

ML&S is now the sole distributor for the DX Commander poles and antenna supports. New products coming soon.

See Mr DXCommander, Callum M0MCX in action
youtube.com/m0mcx

### GAP Antennas from the USA are in stock!

Unique Features Standard to All GAP Antennas; Unique "Elevated" Feed, No Tuning Required, No Traps No Coils, Automatic Band Switching, No Tuner Required! Input Power : Legal Limit*, Input Impedance: 52 ohms Nominal.

| | | |
|---|---|---|
| GAP Challenger DX-8 | 80m-2m 2kW, 31.5ft tall | £449.95 |
| GAP Eagle-DX | 40m-10m 2kW, 21ft tall | £449.95 |
| GAP Titan-DX | 80m-10m 2kW, 25ft tall | £469.95 |
| GAP Voyager DX-4 | 160m-20m, 2kW, 45ft tall | £529.95 |

### Hustler Antennas

Hustler are one of America's oldest manufacturers of Ham Radio antennas. The famous "White Whips" have been seen on many cars operating HF mobile. Their HF base range of 4, 5 or 6-BTV antennas are probably the easiest to assemble and get going and of course are ground mounted, operating with just an earth spike mounted close to the base.

Base Station Range. Free standing, max 7.3m tall, 1kW

| | | |
|---|---|---|
| 4-BTV | 40/20/15/10m | £189.95 |
| 5-BTV | 80/40/20/15/10m | £239.95 |
| 6-BTV | 80/40/30/20/15/10m | £279.95 |

*see www.HamRadio.co.uk/hustler*

### MP1DXMAX

Frequencies:
3.5 MHz ~ 30 MHz
+ plus 144 ~ 148 MHz

Meter Bands:
80m - 75m - 60m
40m - 30m - 20m
17m - 15m - 12m
11m - 10m - 6m
*+ plus*
Simultaneous 2m

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# ATV

## QO-100 DATV net

Since the start of the UK 'lockdown', the BATC has been organising an amateur television net on the QO-100 wideband transponder every Thursday at 8pm. This enables ATV operators to exchange ideas about their current projects and provides at least some substitute for face-to-face meetings.

The downlink frequency for the net is 10499.25MHz and all stations are encouraged to use the same transmission parameters: 333kS, FEC 2/3, H264 encoding. These parameters were chosen because they are well within the capabilities of the BATC Portsdown (and other easily available) transmitting and receiving systems. Whilst not needing too much transmit power, they result in reasonable picture quality. The net is controlled through the chat channel on QO-100 wideband spectrum monitor [1].

You can watch the net even if you are unable to receive it directly from the satellite, as the video and audio is relayed on a BATC stream on the internet [2]. There are normally at least 10 participants; with each having two transmissions (overs) of 3 minutes or so, the net lasts for between an hour and 90 minutes. Some pictures received from the net are shown in Photo 1.

PHOTO 1: TV pictures from some participants in the BATC QO-100 DATV net.

## Technical innovation

Increased ATV activity continues to drive technical innovation. A number of ATV operators have now started using similar hardware to the BATC Portsdown transmitter to build a narrow-band VHF/UHF and microwave SSB/CW/FM transceiver based on the Raspberry Pi 4 with a 7 inch touchscreen and the Pluto SDR. (The Langstone system by Colin, G4EML is described on the UK Microwave Group Wiki [3]).

Although there were difficulties with porting the Portsdown software from the Raspberry Pi 3 to the Raspberry Pi 4, the Portsdown LongMynd DATV receive system has now been modified to run on the Langstone hardware – it just needs a BATC MiniTiouner to be connected to the system by USB to enable reception of video and audio. Photo 2 and Photo 3 show the system in both modes, as an FM transceiver and also as a DATV receiver with a test card received from Antonio, IK2OWU in Milan.

## The Ryde project

There are two primary sets of equipment currently being used to receive reduced bandwidth DATV (RB-DATV). Both are based on the use of a specific Serit satellite tuner with an added USB interface: the first uses the MiniTioune series of applications written by Jean-Pierre, F6DZP and running on a Windows PC; the second uses an open-source 'C' application (LongMynd) originally written by Heather, M0HMO and running on a Linux computer such as the Raspberry Pi. Existing commercial set-top box DVB-S/S2 receivers are not capable of receiving RB-DATV as they are generally limited to receiving a minimum of 1 million symbols/second (1MS). Amateur RB-DATV transmissions use symbol rates down to 33 thousand symbols/second (33kS).

Collaborative work has now started on the 'Ryde project' to produce a set-top box based on the Serit satellite tuner that will be controlled by an infrared remote control and use a single board computer to connect to a standard TV through HDMI in a similar way to commercial set-top boxes. This is a great initiative to simplify the reception of DATV. Track the progress of this exciting project and get involved on the BATC Forum [4]. Perhaps you could help?

PHOTO 2: Langstone transceiver in narrowband mode.

PHOTO 3: Langstone transceiver in DATV mode.

Websearch

[1] https://eshail.batc.org.uk/wb/
[2] https://batc.org.uk/live/oscar100net
[3] https://wiki.microwavers.org.uk/Langstone_Project
[4] https://forum.batc.org.uk/viewtopic.php?f=15&t=6628

Dave Crump, G8GKQ
dave.g8gkq@gmail.com

# Antennas

## The log periodic antenna: part 1

The log periodic antenna is a multi-element beam array capable of operating over a wide frequency range. This has the advantage for the amateur station that several amateur bands can be covered by one antenna. The log periodic antenna is often encountered in commercial applications where the ability to cover a wide frequency range is desirable, eg TV reception, RF test laboratories, military communications, aviation and so on.

PHOTO 1. An example of a commercially produced log periodic antenna covering 50MHz to 440MHz (6m to 70cm).

## Overview

The log periodic antenna was developed and proved in the 1950s by D E Isbell and R H DuHamel [1] at Illinois University, USA. This antenna design has been used at HF, VHF, UHF and above where a compact beam antenna can be advantageous compared to other forms of antenna. In addition to providing a means to operate over a wide frequency range, this beam antenna has the advantage that it tends to have small side and back lobes. An example of a commercially produced log periodic antenna, covering 6m to 70cm, is shown in **Photo 1**.

The log periodic antenna comprises a series of interconnected dipoles whose individual lengths gradually decrease along the length of the antenna, as shown in **Figure 1**. The longest dipole's length ($\ell_1$) is approximately half a wavelength long ($\lambda/2$) at the lowest frequency of operation, while the shortest dipole's length ($\ell_n$) is about $\lambda/2$ long at well above the highest frequency of operation. The dipoles share a common transmission line where the dipoles' centre points are connected to provide a phase reversal, or crossover, between each dipole. Usually, for practical reasons, the elements forming each dipole are tubular and their diameters gradually reduce in size as the dipoles' lengths decrease.

The antenna's feed point is located at the end of the transmission line where the shortest dipole is connected. As a result, this feeding arrangement means this is an end-fire antenna. When used at frequencies above 30MHz, the antenna's transmission line is often formed as a parallel twin boom that supports the dipoles.

As the frequency of operation changes, adjacent dipoles within the array become close to resonance, or are resonant, so forming an active RF radiating region. This active region usually is formed by two or three dipoles and as the frequency of operation is increased, so the active region moves along the antenna, as shown in **Figure 2**.

To help improve matching the antenna to the feeder cable, a shorted tuning stub is sometimes added to the transmission line's end where the longest dipole is connected.

## Outline operation

The operation of the antenna can be described by considering two parallel $\lambda/2$ dipoles separated by $\lambda/4$ at the operating frequency [2] as shown in **Figure 3**. The two dipoles are fed with RF signals of the same amplitude, however the RF signal fed into Dipole A leads that fed into Dipole B by 90° (ie by $\lambda/4$). In the horizontal plane, both dipoles radiate an RF field equally in all directions. In the direction from Dipole A to B, the RF signal radiated by Dipole A travels a distance of $\lambda/4$, and so experiences a phase lag of 90°, before encountering Dipole B. Consequently, at Dipole B, the RF fields are in phase and are additive, resulting in enhanced radiation ahead of Dipole B in this direction. However, in the direction Dipole B to A, the reverse situation occurs and the RF fields are -180° out of phase and tend to cancel at Dipole A, resulting in little RF radiation in this direction. Therefore, in the direction A to B, the effect of the two dipoles is to produce a gain. This effect can be further enhanced if another dipole (ie Dipole C, not shown) is introduced $\lambda/4$ ahead of Dipole B provided this dipole is fed with an RF signal lagging the RF signal fed to Dipole B by 90°. Effectively, the three dipoles can be thought of as acting like a Yagi beam. Within the log periodic antenna, which comprises an array of series connected dipoles that decrease in size, as the frequency of operation increases so consecutive dipoles will become energised and radiate a beam at the higher frequency ahead of the antenna.

## Technical aspects

To follow is an introduction to the log periodic antenna's design aspects. Should further detail be required, it is suggested that the *ARRL Antenna Book* [3] should be referred to.

Figure 1 shows the basic layout of a log periodic antenna. Angle α (alpha) defines the physical outline of the antenna and allows all the dimensions to be treated as a radius (R) of a circle, where:

$$\frac{R_n}{R_{n-1}} = \frac{\ell_n}{\ell_{n-1}} = \frac{D_n}{D_{n-1}} = \tau$$

Constant $\tau$ (tau) is known as the scale factor.

Allowing a suitable lower frequency undershoot margin (eg 7%) for the lowest

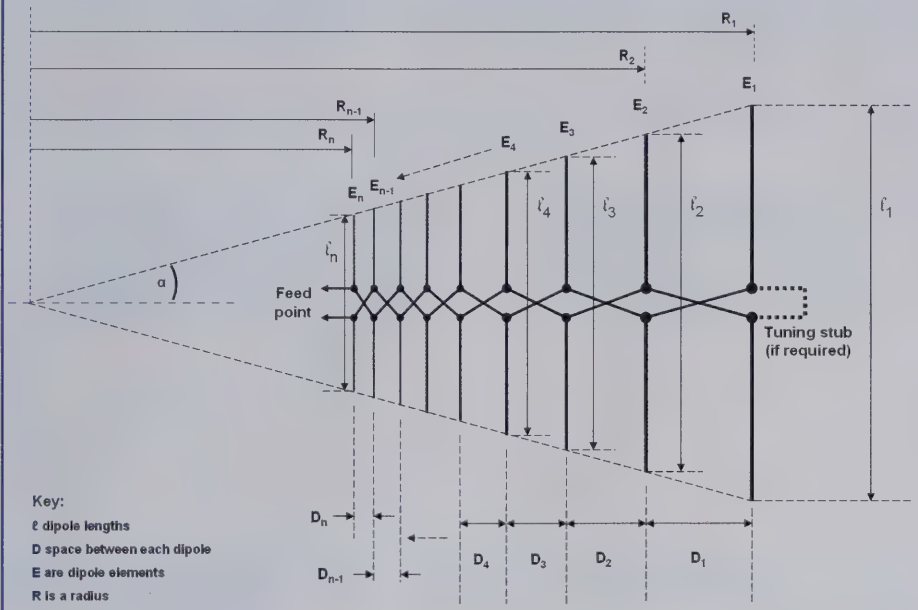


FIGURE 1: Concept of the layout of the log periodic antenna.

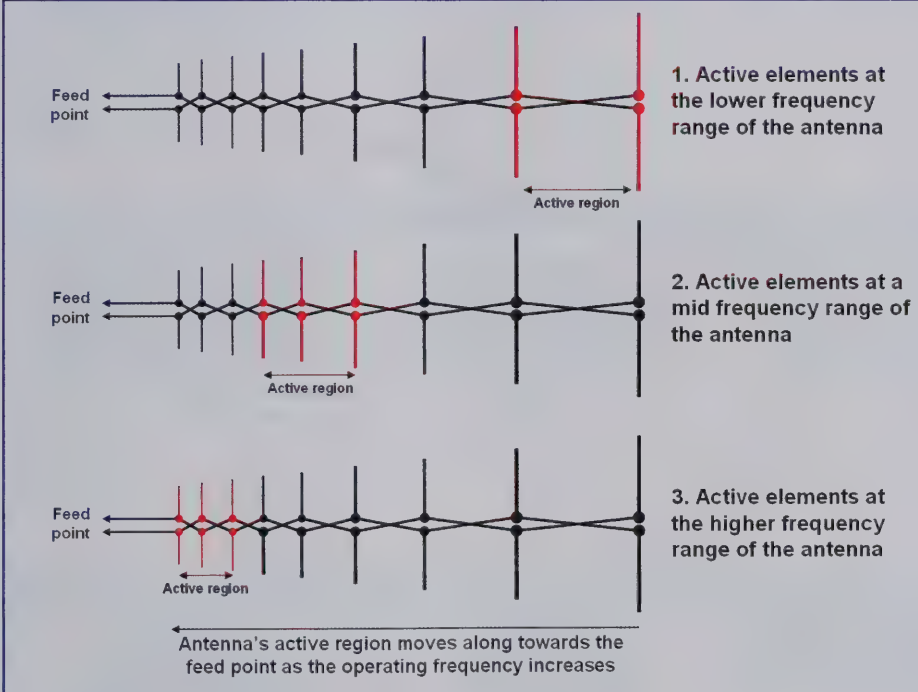
Feed point
Active region
1. Active elements at the lower frequency range of the antenna
Feed point
Active region
2. Active elements at a mid frequency range of the antenna
Feed point
Active region
3. Active elements at the higher frequency range of the antenna
Antenna's active region moves along towards the feed point as the operating frequency increases

FIGURE 2: Within a log periodic antenna, as the operating frequency increases, so the active region moves along antenna (as shown by the red dipoles).

operating frequency ($f_{min}$), the longest dipole's length ($\ell_1$) is given by:

$$\ell_1 \text{ (m)} = \frac{150 \times 1.07}{f_{min}}$$

The interconnected dipoles' individual lengths then gradually decrease along the antenna's length such that:

$$\frac{\ell_2}{\ell_1} = \frac{\ell_3}{\ell_2} = \frac{\ell_4}{\ell_3} \text{ and so on until } \frac{\ell_n}{\ell_{n-1}} = \tau$$

Similarly, the distances (D) between the dipoles gradually decrease:

$$\frac{D_2}{D_1} = \frac{D_3}{D_2} = \frac{D_4}{D_3} \text{ and so on until } \frac{D_n}{D_{n-1}} = \tau$$

A small angle α value can make the antenna very long and difficult to build. Conversely, if angle α is too broad, this can make the antenna very wide compared to its length, leading to performance problems associated with the spacing (D) of the dipoles. As a compromise, angle α is often about 14°.

Note: Doubling angle α gives the antenna's apex angle, in this case 28°.

The value of τ usually lies between 0.80 and 0.98 and, for amateur applications, is often taken as 0.9.

The transmission line that interconnects the individual dipoles has a characteristic impedance (Zo) whose value is influenced by a complex relationship involving several factors. These include the distance between the conductors forming the transmission line, their physical size, the type of insulation material used between them and the combined effect of the series of dipoles connected in parallel along the line.

Often, two round section tubes are used for the twin boom forming the transmission line. With this arrangement, the value of Zo may exceed 200Ω depending upon the factors involved with the transmission line's implementation. However, using square section bars for the twin boom can give a Zo of about 50Ω to 100Ω. Consequently, some form of balun is required to match the feeder cable to the antenna.

The antenna's directional gain is a function of the scale factor τ and angle α, which determine the dipoles' lengths and the spacing between them. A third factor often encountered is the relative spacing factor σ (sigma) which, in conjunction α and the τ, also influences the antenna's theoretical forward gain. The relationship between α, τ and σ is often presented in the form of plots on a Carrel, Butsen and Thompson chart, which enables the antenna's theoretical gain to be estimated [3].

## Predicted performance

The performance for a log periodic antenna was modelled using MMANA-GAL [4]. The model was based on the 50 to 150MHz antenna devised some years ago by William Nagle, W3DUQ (SK), which continues to be published [5] [6].

**Figure 4** shows the concept of the W3DUQ 50 to 150MHz log periodic, which comprises 15 dipoles situated on a double boom forming the transmission line. The illustration includes the elements' layout in terms of their particular supporting boom:

**Mike Parkin, G0JMI**
email2mikeparkin@gmail.com

the blue elements are attached to the upper boom, while those in red are attached to the lower boom. The feeder coax cable is run through the lower boom tube to the feed point.

A tuning stub was added to the rear of the antenna model, behind the longest dipole, enabling the SWR to be improved across the frequencies modelled, 50.2, 70.2 and 144.5MHz. The model was run with the antenna situated at 7m above the ground level (AGL) to simulate operation from an actual location.

Figure 5 shows the predicted horizontal plane radiation patterns obtained.

- At 50.2MHz, the antenna model was close to the lowest frequency of operation, as indicated by the radiation pattern resembling that of a dipole. However, the model predicted a gain of around 9dBi for the antenna, although the front to back ratio (f/b) was poor, at around 2dB. The predicted SWR, referred to 50Ω, was close to 1.9:1 and this is not unusual for a log periodic antenna.
- At 70.2MHz, the antenna's radiation pattern shows that a large main lobe has developed ahead of the antenna, with the pattern resembling that of a Yagi beam. The predicted gain has improved to about 13dBi, with a noticeable improvement in the f/b ratio to about 7dB. The predicted SWR was now 1.77:1.
- At 144.5MHz the gain has continued to improve, to about 14dBi, although side lobes have now developed either side of the main lobe. The f/b has improved again, to about 9dB. The predicted SWR is now 1.8:1 and has not significantly changed from that predicted on the 6m and 4m bands.

## Summary

An introduction to the outline design and operation of the log period antenna has been the theme this month. Next month continues this theme with a practical overview the design concepts associated with this antenna.

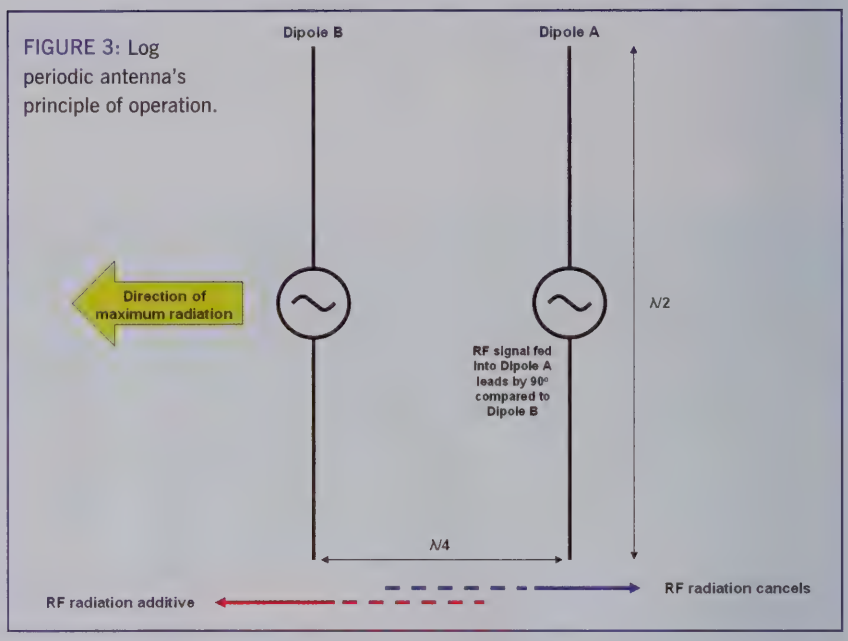


FIGURE 3: Log periodic antenna's principle of operation.

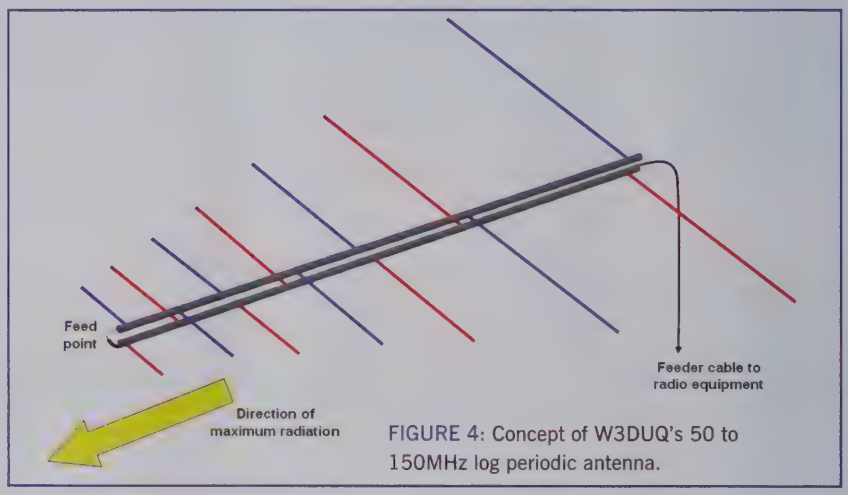


FIGURE 4: Concept of W3DUQ's 50 to 150MHz log periodic antenna.

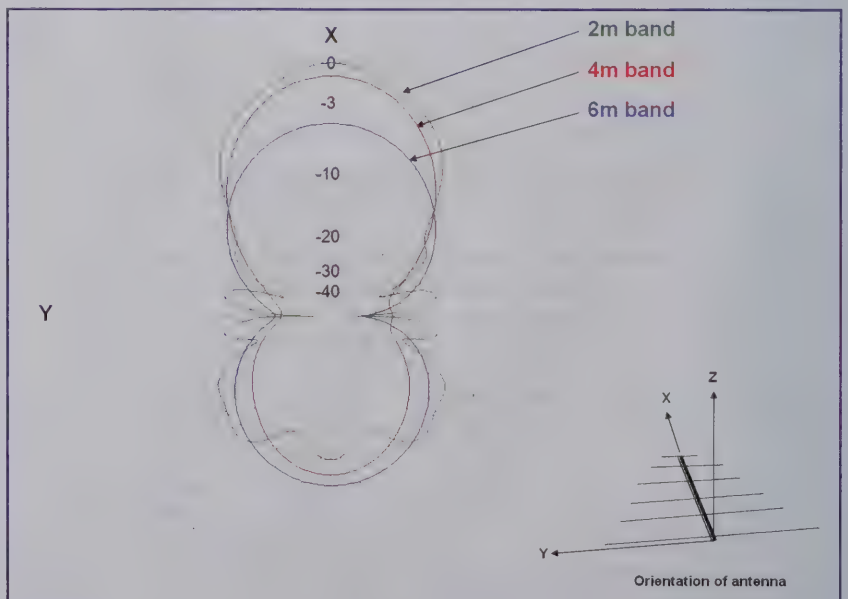


FIGURE 5: MMANA-GAL predicted horizontal plane radiation patterns for the W3DUQ log periodic antenna on the 6m, 4m and 2m bands.


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[2] *Radio Systems III,* by D C Green: Chapter 5 Aerials, pages 91 – 95; Pitman Publishing Ltd, 1979

[3] *ARRL Antenna Book* 23rd edition, edited by H W Silver, N0AX: Chapter 7, Log-Periodic Dipole Arrays, pages 7.1 – 7.12

[4] MMANA-GAL basic V3.0.0.31, freeware antenna analysing application. Original code by Makoto Mori JE3HHT. MMANA-GAL basic and MMANA-GAL Pro by Alex Schewelew DL1PBD and Igor Gontcharenko DL2KQ, 1999 onwards

[5] Log Periodic Designs for VHF/UHF, *Amateur Radio 73,* by William Nagle, W3DUQ, pages 45 – 47; published by 73 Inc, Peterborough, NH, USA, August 1970

[6] RSGB *Radio Communication Handbook,* 13th edition edited by Mike Browne, G3DIH: Chapter 16, Practical VHF/UHF Antennas, pages 16.15 – 16.165

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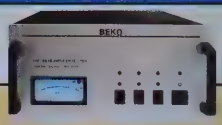

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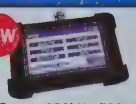

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- Ideal for 6m, 2m UHF, VHF, TV, FM antennas
- Programmable controller

**£199.95**

**CREATE**
**High Quality Japanese manufacture Using a worm gear for higher Torque**

**RC5-B3** Heavy Duty
- Rotating torque 22 kg/m
- Brake torque 250 kg/m
- Mast dia. 48-63mm
- Vertical load 700 kg
- Horizontal load 1,000 kg
- Controller w/preset

**£1289.95**

**RC5-A3**
Heavy Duty with pre-set
- Rotating torque 16 kg/m
- Brake torque 200 kg/m
- Mast dia. 48-63 mm,
- Vertical load 700 kg
- Horizontal load 1000 kg
- Variable speed 75-110

**£899.95**

**Medium Duty models**
**RC5-3**.....Medium/HD w/pre-set.....**£679.95**
**RC5-1**.....Medium duty .....**£569.95**
**Mast clamp**
**MC-2** ... ...Set of mast clamps .....**£114.95**

## SIRIO ANTENNAS

**Quality Antennas from Italy!**

**SY400-10N**
- 70cms 10 element
- Wideband 400-470MHz
- Boom: 2m, Gain: 14 dBi

**£119.00**

**VHF/UHF Verticals**
**CX4-68** .....(68 – 73)MHz 4m 4.15 dBi .....**£69.95**
**CX440**.....(440 – 455)MHz pmr 4.15 dBi .....**£ 39.95**
**CX455**.....(455 – 470)MHz pmr 4.15 dBi .....**£39.95**
**TORNADO 50-60**...(50 – 60)MHz 6m 3.5dBi .....**£59.95**

**HF/VHF/UHF Beams**
**SY3** .....3 el (26-28)MHz 10.65 dBi..... .....**£99.95**
**SY4** .....3 el (26-28)MHz 13.15 dBi . .....**£119.95**
**SY50-3**.....3 el 50MHz 8.5 dBi.....**£99.95**
**SY50-5**.....5 el 50MHz 10.5dBi.....**£129.95**
**SY68-3**.....3 el 70MHz 7.0 dBi.....**£79.95**
**WY108-3n**..3 el 108-137MHz 3 el. Air Band .....**£89.95**
**WY140-6n**..6 el 144MHz (wide band) 10.5 dBi...**£99.95**
**WY400-6n**..6 el 432MHz (wide band) 11.0dBi....**£79.95**
**WY400-10n**10 el 432MHz (wide band) 14.0dBi..**£119.00**

## NEVADA

**PS-40M**
Linear
- 40A (max) with meter
- 1.5-15V DC
- Cigar adaptor output

**£129.95**

**Quality Power Supplies 2 YEAR WARRANTY!**
**PS-08**.....Linear 8A (max) 13.8V DC.....**£34.95**
**PS-30M**.....Linear 30A (max) 3-15V DC.....**£99.95**
**PSW-50**.....Switch mode 50A (max) 9-15V DC..**£129.95**
**PSW-30**.....Switch mode 30A (max) 9-15V DC....**£79.95**
**PSW-30H**.....Switch mode 30A (max) 9-15V DC....**£69.95**
**PS23-SW1**...Switch mode 23A (max) 13.8V DC....**£59.95**
**PSW-07**.....Switch mode 7A (max) 13.8V DC .....**£29.95**
**PSW-04**.....Switch mode 5A (max) 13.8V DC .....**£24.95**

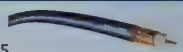
## SSB

**SSB Masthead Preamplifiers**

**SUPER AMP - SERIES**
Super-low-noise, large-signal handling, protective circuit. High quality Helix filters, Vox control, remote & T bias DC feed.

**HP70** .....70 cm, 0.7 NF. 20dB, 100/500W.....**£320**
**HP-200**.....144 MHz 0.5 NF. 20dB 100/750W..**£320**
**DCW-2004B**...Sequencer 6/2/70cm.....**£245**

## ULTRA LOW LOSS COAX



**Ecoflex 15**
per metre.....£7.99 price per 102m drum .....**£759**
**Ecoflex 15 plus**
per metre.....£7.99 price per 102m drum .....**£759**
PL259 connector (Part: 7350).....**£8.95**
N type connector (Part: 7395).....**£9.95**
**Ecoflex 10**
per metre.....£3.79 price per 102m drum .....**£359**
**Ecoflex 10 Plus**
per metre.....£3.79 price per 102m drum .....**£359**
PL259 connector (part: 7378).....**£5.95**
N type connector (part: 7367 .....**£6.50**
**Aircell 7**
per metre.....£2.99 price per 102m drum .....**£269**
PL259 connector (part: 7390).....**£2.65**
N type connector (part: 7392) .....**£5.25**
**Aircell 5**
per metre.....£2.75 price per 102m drum .....**£259**
**Other 100M Coax Drums**
Westflex 103 ..Semi Air-spaced low loss .....**£179.95**
RG-213 (Cabnex).....Low loss good quality .....**£99.95**
RG-Mini 8.....Super XX.....**£69.95**
RG58/CU.....Mil spec .....**£39.95**
**Twin Feeders**
450 Ohm.....Twin feeder .....**£89.00**
300 Ohm.....Twin feeder .....**£76.50**
**Nevada Antenna Wire**
Coated flex weave Antenna wire.....**£59.95**
**Nevada KEVLAR – green ultra-strong wire!**
Nevada 28.....2.8mm 2kW.....per metre.....**£0.99**
Nevada 32.....3.2mm 5kW.....per metre.....**£1.20**

## INRAD

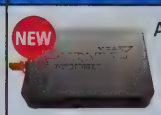
**INRAD W-1**
Competition Headset
Ham radio never sounded so good!
- Super comfortable & great audio
- Headband tilt-back feature like pro broadcast headsets
- Large high response speakers
- Boom mic with great transmit audio

**£179.95**

Requires optional adaptor select Icom, Yaesu, Kenwood .....**£22.95**

## AIRSPY

NEW



**Airspy HF+ Discovery**
- HF - 0.5 kHz, 31MHz
- VHF - 60, 260MHz
- Pre-selectors

**£199.95**

**AIRSPY R2**
- 24MHz-1,800MHz
- 10MHz spectrum
- Tracking RF filters

**£199.95**

**AIRSPY Mini**
- SDR Dongle
- 24 – 1,800MHz

**£119.95**

## SDRplay

NEW

**RSPdx** SDR in metal case
Covers: 1 kHz - 2GHz
Now with Improved:
- Performance below 2MHz
- Plus more!

**£194.95**

**RSP 1A** Wideband Budget SDR
- Covers: 1 kHz - 2GHz
- Software upgradable
- Good dynamic range

**£94.95**

**RSP DUO** Dual Tuner SDR
- Covers: 1 kHz - 2GHz
- Software upgradable

**£239.95**

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## HIGH PERFORMANCE BEAMS

### DUAL Antennas by YU1CF

**High Performance Beams using Professional 3D EM modelling**

**6M Yagis**

| | | |
|---|---|---|
| PA-50-4-3B | 4 el. 9.2 dBi 2.92m boom | £139.95 |
| PA-50-6-6BG | 6 el. 11.5dBi 5.84m boom | £245.00 |
| PA-50-7-9BGP | 7 el.12.7 dBi…8.68m boom | £299.95 |

**Dual Band 6/4**

| | | |
|---|---|---|
| PA5070-7-3 | 6m 3el 4m 4 element 3m boom | £199.95 |
| PA5070-11-6 BG | 6m 5el 4m 6 element 6m boom | £259.95 |

**4M Yagis**

| | | |
|---|---|---|
| PA70-5-3 | 4m 5 element Yagi 3m boom | £199.95 |
| PA70-6-4 | 4m 6 element Yagi 6m boom | £219.95 |

**Dual Band 2/70cms**

| | | |
|---|---|---|
| PA144-432-37-7-2CBGB | 2m 12 el 70cms 25 el 2 connectors | £289.95 |
| PA144-432-13-1.5-2CB | 2m 5 el 70cms 9 el 2 connectors | £134.95 |
| PA144-432-17-2 | 2m 6 element 70cms 12 element | £149.95 |
| PA144-432-19-3-2C | 2m 7 element 70cms 12 element | £199.95 |
| PA144-432-21-3B | 2m 7 element 70cms 14 element | £199.95 |
| PA144-432-13-1.5A | 2m 5 el. 70cms 9 el 1.5m boom | £134.95 |
| PA144-432-34-6-2CBG | 2m 11el, 70cm 23 el. 2 conn | £249.95 |
| PA144-432-38-6BG | 2m 11 el. 70cms 28 element | £225.95 |

**2M Yagis**

| | | |
|---|---|---|
| PA144-5-1.5 | 2m 5 element Yagi 1.5m boom | £94.95 |
| PA144-6-2 | 2m 6 element Yagi 2m boom | £119.95 |
| PA144-8-3 | 2m 8 element Yagi 3m boom | £135.95 |
| PA144-9-5A | 2m 9 element portable 4.67m | £174.95 |
| PA144-11-6BG | 2m 11 element guyed 5.72m | £199.95 |
| PA144-12-7BGP | 2m 12 element Yagi | £259.95 |

**70cms Yagis**

| | | |
|---|---|---|
| PA432-8-1.2R | 70cms 8 element Yagi 1.2m boom | £89.95 |
| PA432-14-3 | 70cms 14 element Yagi 3m boom | £145.95 |
| PA432-23-6 | 70cms 23 element Yagi 6m boom | £199.95 |
| PA432-30-8BG | 70cms 30 element Yagi 8m boom | £269.95 |

**23cms Yagis**

| | | |
|---|---|---|
| PA1296-13-1R | 23cms 13 element 1m rear mount | £99.95 |
| PA1296-18-1.5AR | 23cms 18 el1.5m rear mount | £139.95 |
| PA1296-36-3BRG | 23cms 36 element 3m RG Balun | £169.95 |
| PA1296-36-3BUT | 23cms 36 el 3m Teflon Balun | £189.95 |
| PA1296-70-6RG | 23cms 70 element 6m RG Balun | £225.95 |

**Power Dividers**

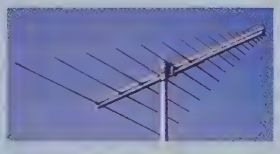
| | | |
|---|---|---|
| PD1024 144MHz | 2 way power divider, 1.5kW | £79.95 |

## CREATE - ANTENNAS

**As used by the 'Professionals'**

**CLP-5130-1N**
21 Element Log Periodic Beam
- 50-1300MHz
- 500W
- Gain: 10-12dBi

**£379.95**



**CLP-5130-2N**
17 Element Log Periodic Beam
- 105-1300MHz
- 500W

**£299.95**

## SPIDERBEAM

**Telescopic Masts and Poles**

**Fibreglass Telescopic Poles**

| | |
|---|---|
| 12mtr Heavy Duty | £99.95 |
| 18mtr Standard | £199.95 |
| 22m 'Long John' NEW | £399.95 |
| 26mtr Standard | £499.95 |
| Base Plate for Fibreglass Poles | £28.95 |

**Aluminium Telescopic masts** *German engineered!*

| | |
|---|---|
| 10 metre Standard (1.35m retracted) | £339.95 |
| 10 metre Heavy Duty (1.7m retracted) | £359.95 |
| 12.5 metre (1.65m retracted) | £359.00 |
| 14.5 metre Heavy Duty (2m retracted) | £459.00 |
| 15 metre Standard (2m retracted) | £409.00 |

## VHF/UHF SELECTION

### 50 MHz Antennas

**Innov Antennas**

| | | |
|---|---|---|
| LFA-8 | 8 element LFA2 13.57 dBi | £599.95 |
| LFA-7 HD | 7 element LFA2-HD 12.8 dBi | £385.95 |
| LFA-7 WOS | 7 element G3WOS 12.9 dBi | £399.95 |
| LFA-6 | 6 element LFA 11.9 dBi | £309.95 |
| LFA-5 | 5 element LFA 11.76 dBi | £289.95 |
| DES-50 | 5 element Opt 9.16 dBi | £199.95 |

**Cushcraft**

| | | |
|---|---|---|
| A50-6S | 6 element rugged 11.6 dBi | £299.95 |
| A50-5S | 5 element rugged 10.5 dBi | £219.95 |

**Hy-Gain**

| | | |
|---|---|---|
| LFA-6M4EL | 4 element LFA 10.7 dBi | £249.95 |
| LFA-6M5EL | 5 element LFA 11.8 dBi | £299.95 |

**Sirio**

| | | |
|---|---|---|
| SY50-5 | 5 element 10.5 dBi | £129.95 |
| SY50-3 | 3 element 8.5dBi | £99.95 |
| Tornado | 50-60 Vertical 3.5 dBi | £59.95 |

**Comet**

| | | |
|---|---|---|
| CA-52HB4 | 4 element Portable 10.4 dBi | £129.95 |
| CA-52HB2 | 2 element Portable 6.3 dBi | £89.95 |

**Diamond**

| | | |
|---|---|---|
| A50HBR | 2 element Portable 6.3 dBi | £89.95 |

### 70 MHz Antennas

**Innov Antennas**

| | | |
|---|---|---|
| LFA-70-6 | 6 element LFA 11.83 dBi | £189.95 |
| LFA-70-4 | 4 element LFA 9.8 dBi | £129.95 |
| LFA-Q | 2 element Quad 6.8 dBi | £84.95 |
| OWL-70 | 6 element W/band 11.02 dBi | £139.95 |

**Sirio**

| | | |
|---|---|---|
| SY-68-3 | 3 element 7 dBi | £79.95 |
| CX-4-68 | Vertical 4.15dBi | £69.95 |

### Dual Band 6/4 metre

**Hy-Gain**

| | | |
|---|---|---|
| DB-46M8EL | 6m 4 element + 4m 4el | £269.95 |

**Innov**

| | | |
|---|---|---|
| DB-664 | 6m/4m on 1.2m boom 3el/6m, 4el.4m | £149.95 |

### 144 MHz Antennas

**Innov**

| | | |
|---|---|---|
| 144-LFA-3 RM | 3 element rear mount.8.67 dBi | £95.95 |
| 144-OWL-3 | 3 element 6.94 dBi. wide band | £39.95 |
| 144-OWL-4 | 4 element 8.58 dBi…wideband | £49.95 |
| 144-LFA-8-Xpol | 8 element crossed 9.49 dBi | £139.95 |

**Hy-Gain**

| | | |
|---|---|---|
| LFA-2M9EL | 9 element 14.04 dBi 4.46m boom | £239.95 |
| LFA-2M12EL | 12 element 15.82 dBi 7.07m.boom | £239.95 |
| LFA-2M16EL | 16 element 17.3 dBi 10.9m boom | £349.95 |

**Cushcraft**

| | | |
|---|---|---|
| A-124-WB | 4 element | £167.95 |
| A-148-10S | 10 element | £169.95 |
| A-148-3S | 3 element 7.8dBi 0.85 boom | £74.40 |
| AR-X2B | Vertical 7 dBi 4.3m long | £139.95 |

### 430 MHz Antennas

**Cushcraft**

| | | |
|---|---|---|
| A719B | 19 element 15dBi 4.1m boom | £249.95 |
| AR-450 | Ringo Vertical 3.dBi 0.43m tall | £79.95 |

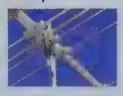
**Diamond**

| | | |
|---|---|---|
| A430S10R | 10 element 13 dBi 1.09m boom | £54.95 |
| A430S15R | 15 element 14.8 dBi 2.26m boom | £64.95 |

## INNOV HF BEAMS

An outstanding range of HF Beams, performance optimised by Justin G0KSC. Ideal for the UK - with both **standard** and **compact** space saving versions

**XR7C**
7 Band compact Beam



- Includes 6m/4m bands - single feed point
- Frequency: 20m/17m/15m/12m/10m/6m/4m
- Boom: 3.5m, Turning radius 4.84m
- Gain: averages 11.24 dBi
- Wind survival: 105 mph

**£1296**

**XR series Beams**

| | | |
|---|---|---|
| XR-3 | 6 element **Standard** 20/15/10m | £795 |
| XR3C | 6 element **Compact** 20/15/10m | £795 |
| XR-4C | 8 element **Compact** 20/15/10/6m | £859 |
| XR-6 | 11 el. **Standard** 20/17/15/12/10/6m | £1195 |
| XR6C | 11 element **Compact** version of XR6 | £1296 |
| XR-7 | 14 element 20/17/15/12/10/6/4m | £1195 |
| XR7C | **Compact** version of XR7 w/4m | £1296 |

We carry the full range of INNOV HF & VHF Antennas
**FULL DETAILS on our WEB SITE**

## COMET

**CAA-500 MkII**
**Commercial Grade Antenna Analyser**
- Frequency: 1.8 - 500MHz
- Colour TFT display shows: Frequency, SWR, Impedance, Resistance, reactance, SWR graph
- Auto Sweep Mode

~~£499.95~~ **£469.95**

**H-422**
**4 Band Dipole**
- Power: 1kW
- Use as V or straight
- Vee: 7.4m
- Straight: 10.3m
- Covers 7/14/21/28MHz

**£289.95**

**HF BASE ANTENNAS**

| | | |
|---|---|---|
| CHA-250BX11 | 3.5 - 57MHz (RX: 2.0 - 90MHz) | 349.00 |
| CWA-1000 | Multi Band dipole 3.5/7/14/21/28MHz | 124.95 |
| AB1230H | Handheld Airband Antenna - RX only | 29.95 |
| AB380 | Civil/Military Base Antenna -RX only | 89.95 |

**VHF/UHF FIBREGLASS BASE ANTENNAS**

| | | |
|---|---|---|
| GP-15N | 50/144/430MHz, length 2.4m N Type | 99.95 |
| GP-1M | 144/430MHz length 1.2m (SO239) | 49.95 |
| GP-3M | 144/430MHz, SO-239 Lgth 1.78m (SO239) | 69.95 |
| GP-6M | 144/430MHz, SO-239 Lgth 3.07m (SO239) | 99.95 |
| GP-93N | 144/430/1200MHz, Length 1.78m N Type | 99.99 |
| GP-9M | 144/430MHz SO-239 Lgth 5.15m (SO239) | 149.95 |
| GP285 | VHF 5/8 Collinear 135 - 175MHz 3.34m | 89.95 |

**VHF/UHF BEAMS**

| | | |
|---|---|---|
| CYA-1216E | 6 Element 1200MHz, N Type | 99.95 |
| CA-52HB | 2 Element HB9CV for 50MHz | 79.95 |
| CA-52HB4 | 4 Element HB9CV for 50MHz | 129.95 |
| CYA2414 | 2.4 GHz 14 Element Yagi 15.5 dBi .0.75m | 99.95 |

**MOBILE ANTENNAS**

| | | |
|---|---|---|
| SB7500 | Hi Gain 144/430MHz length 1.05m | 59.95 |
| SB7700 | Hi Gain 144/430MHz length 1.28m | 69.95 |
| SB7900 | Hi Gain 144/430MHz length 1.56m | 79.95 |
| CSW201G | 2 Way Antenna Switch SO239 1kW 600MHz | 29.95 |

**ANTENNA TUNER**

| | | |
|---|---|---|
| CAT-300 | 1.8-56MHz, 300W (PEP) | 199.95 |
| CAT-10 | 10W Antenna tuner (3.5 - 50)MHz | 129.95 |

**BALUNS**

| | | |
|---|---|---|
| CBL-1000 | 1.7-30MHz, 1kW/CW | 34.95 |
| CBL-2500 | 1.8-56MHz, 2.5kW/CW | 39.95 |

**LOW PASS FILTERS**

| | | |
|---|---|---|
| CF-30MR | 1.8 - 32MHz, 1kW/CW | 59.95 |
| CF-50MR | 1.8 - 57MHz, 1kW/CW | 59.95 |

**TRIPLEXERS**

| | | |
|---|---|---|
| CFX431A | 144/430/1200 MHz N/PL/PL | 89.95 |
| CFX514N | 50/144/430 MHz N/PL/PL | 69.95 |

**DUPLEXERS**

| | | |
|---|---|---|
| CF-360A | 1.3-30/49-470MHz 2xleads SO239 socket | 49.95 |
| CF-4160B | 1.3-170/350-540MHz SO239 N Type, SO239 | 39.95 |
| CF-416A | 1.3-170/350-540MHz SO239 + 2 x PL259 leads | 39.95 |
| CF-416B | SO239 + 1 x PL259/N leads | 39.95 |
| CF-503C | 1.3-90/125-470MHz, PL259 lead, 2xSO239 | 49.95 |
| CF-530 | 1.3-90/125-470MHz 2x SO239,PL259 lead | 49.95 |
| CF-530C | 1.3-90/125-470MHz, SO239 2 x PL259 lead | 49.95 |
| CF-706 | 1.3-57/75-550MHz,SO239, 2 x PL259 leads | 49.95 |
| CF-706N | 1.3-57/75-550MHz, SO239 N type, PL259 leads | 49.95 |

**CROSS NEEDLE SWR/POWER METERS**

| | | |
|---|---|---|
| CMX-200 | 1.8-200MHz, 30/300/3k | 79.95 |
| CMX-400 | 140-525MHz, 30/60/300W | 89.95 |

**ACCESSORIES**

| | | |
|---|---|---|
| CSW201G | 2 Way Ant. Switch - SO239 1kW 600MHz | 29.95 |
| CS400P | Lightning Arrestor DC-500MHz 500W | 29.95 |

Lots more **COMET** on our website

## STEPPIR – CLEARANCE PRICES

**Prices apply to 'In stock' items only!**

**DB-18E**
- 40m-10m (6m optional)
- 3 loop elements

RRP ~~£3924~~.95

**£3335**

**BEAMS & DIPOLE**

| | | |
|---|---|---|
| Dipole | (20 – 6m) with controller | ~~£1099.95~~ £935 |
| DB-18E Yagi | (40 – 6m) 3 loops | ~~£3924.95~~ £3335 |
| DB-36 Yagi | (40 – 6m) 3 loops | ~~£5499.95~~ £4675 |
| 2 Element Yagi | (ST-00202) (20 – 6m) | ~~£1699.00~~ £1499 |

**PRICE PLEDGE WE ALWAYS AIM TO BE COMPETITIVE - SEEN IT CHEAPER? LET US KNOW!**

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# HF

The 20m 4-Square and QTH of R207RRC, which was active from Kosa Dvukh Pilotov (AS-207), an island in the Chukchi Sea near Wrangel Island.

The RI0B team made 5600 QSOs from Rastorguyeva Island (AS-068).

**The higher bands came alive in May even though the solar flux at 66 was as low as it ever gets.**

Seasonal changes in atmospheric chemistry meant the electron density in the F layer went up, and Sporadic-E ensured a lot of single and multi-hop QSOs on 10m. There was also considerable very long distance 10m propagation particularly, but not exclusively, on FT8. UK stations reported working Japan, south-east Asia, the US west coast and the Caribbean. The mechanism for some of these QSOs is not well understood. 6m operators have been working Japan around sunspot minimum in June for years and there are various ducting/chordal hop theories, but Club Log does not show many QSOs on 10m at the same times. In fact, there are 226 G-JA 6m QSOs in the Club Log database for June at sunspot minimum but only 28 on 10m. I find that puzzling but maybe people just migrated to the highest open band. Anyway, let's hope the conditions last well into the summer.

Last month, I looked at 15m propagation to Japan from the UK using the Club Log database of QSOs. This month I'm looking at the path just west of north to Hawaii that yields large numbers of 20m QSOs in the summer. There is a potential problem with extracting this data as KH6 callsigns can now be used from anywhere in the USA but Alan, 5B4AHJ does a lot of work behind the scenes in Club Log to track which calls are really from Hawaii.

I started by looking at total G-KH6 QSOs in the database for all stages of the solar cycle. There were 559 on 10m and 65% were between 0700 and 1000UTC. The remainder on 10m were between 1600 and 2000UTC. These will almost all have been at sunspot maximum. There were 708 QSOs on 15m – but on this band the picture was reversed; 65% were in the evening between 1600 and 2100UTC with the rest between 0600 and 1000UTC. On 20m there were 2657 QSOs, 73% of which were in the 0600-1000UTC period.

Next, I looked at the monthly G-KH6 propagation on 20m and 15m at sunspot minimum and the results are shown in **Figure 1**. There is a huge summer peak in the number of QSOs in the morning and, surprisingly, a corresponding dip in the number of early evening QSOs. Some of the evening QSOs may be long path through the winter hemisphere and therefore less common in the UK summer but I would have expected more short path evening contacts. 15m QSOs were few and far between.

The Russian Robinson Club members were very active in March/April despite the Coronavirus pandemic. The RI0B team of three did an amazing job after hauling their equipment over 2500km on cargo sleds behind their snowmobiles. They made 5600 QSOs from Rastorguyeva Island (AS-068). A few weeks later R207RRC was active from Kosa Dvukh Pilotov (AS-207), an island in the Chukchi Sea near Wrangel Island. The name refers to two American aviators who were killed in a plane crash there in 1929 while on a rescue mission to a ship trapped in ice near Cape Schmidt. Full historical details about the pilots are on the DXpedition website at r207rrc.ru/en. R207RRC made 8320 QSOs on 20m, 30m, and 40m with signals generally audible on 20 from 0700UTC to dusk. Down in southern Chile more of the Robinsons were active as XR8RRC from Wellington Island (SA-032). They had a tricky journey home as airports closed around them and had to drive 1000km in a rented vehicle to reach Santiago, but eventually made it to Moscow.

The IOTA management team announced last month that QSO credits can now be obtained via Logbook of the World as well as via Club Log. Details are on the iota-world.org website. There are two types of IOTAs available on LoTW. The first category is where an entire DXCC country (eg ZD7) is a single IOTA and there are about 100 of these. The second is everything else and requires the IOTA website to know the exact time/date of the first and last QSO with a particular callsign from a particular IOTA. This database is gradually being extended with a focus on the rarer entities.

Two new members were inducted to the CQ DX Hall of Fame in May: 'Ned' Stearns, AA7A and Tony Gonzalez, EA5RM. They have both been on many DXpeditions but in addition AA7A worked with K1JT to develop the FT8 Fox/Hound mode, and EA5RM made 10 trips to Bolivia to set up communications links with remote villages.

IOTA 'Expeditioner of the Year' Awards were announced for Mike, VE7ACN

The RI0B team hauled their equipment over 2,500km on cargo sleds behind their snowmobiles.

UA3AKO and UA0KBG operating R207RRC. The DXpedition made 8320 QSOs on 20m, 30m, and 40m with signals generally audible on 20 from 0700UTC to dusk.

(1st place), Vasily, R7AL (2nd) and Vlad, RK8A (3rd). There is more information at irefradio.com.

The EI DX Group is running a Summer Challenge from 1 June to 30 August. You need to work as many DXCCs, CQ WAZ, participating EIDXG members and EI/GI counties as possible – but only once regardless of band or mode. See www.eidxg.com/sc2020.

The VK5KI expedition to Kangaroo Island (OC-139) will take place from 13-18 July. Ops will be VK5GR and VK5AKH.

## Correspondence

(CW QSOs in blue, SSB in red, FT8 and other data modes in black italics. L= Linear, - = No Linear, S = Simple Antennas, B = Beam)

Tony, MOIQD [-B] reports: 10m – PYs ZD7FT, LUs, CE7VPQ, 8P6s, FM5DN, FG4SO, PJ4s, Z39M, SO1WS, 4L4WW, OY1OF, ER0ITU, HZ1SM, UA2DF, W2RE, RM8A, HP9SAM, 0Z4AH, HZ1SK, ER4DX, PY4JW, W1NA, N1RR, HC5DX, 4L/G4ENL; 12m – OD5PY, OD5OJ, ZP5DA, CV7STAYHOME, 9K2HS, FM5DN, SV9ANK; 15m – ZD7FT, FR4QT; 17m – LUs, VP8LP, ZL3OZ, ZP5DA, CO8LY, 9Z4Y, JAs, HH2AA, 9Z4AH, CE1OBE, HP9SAM; 20m – TR8CA, VP8LP, ZL3OZ, E51JD, JW4GUA, SU3YM, HC2PY, VP2EIH, KL7s, CE7VPQ, VU3WEW, JA0FIL, 5Z4BU, HI8AT, 3V8MN, BJ7AJH, KH6s, FS5GL, XE1CQ, E20WXA, ER0ITU, 8J1ITU, A25SL, VK2BY, ZL3OZ/M, 9Z4Y, VK2BY, XQ6CF, 6Y5FS, HP9SAM, EK6SI, JW4PUA, KL7KK, 3V8MN, PJ2MAN; 40m – ZL4RMF, ER75V, JY5IQ, A41CK.

Martin, G0HDB [LS] was mainly on 6m but ventured onto HF FT8 from time to time. He notes that 10 and 12m were often open to South America and the Caribbean until after midnight. He found: 10m – *J68HZ, 9Y4DG, HC5F, VU2OT, 4S6NCH, HZ1SK, 8P2K, HK3J, HJ4JRZ, CP6UA, TI2CC;* 12m – *CE2SV, HK3J, KP4JFR, YV4ABR, HC6IU, HI8DL, HK3PJ, 9Z4DZ;* 15m – *EL2BG, 8P6PD, HP1AVS, 9Z4Y, OA9DVK, 5H3DX, 9Y4VF;* 17m – *VU2AE, EL2BG, WY7W, VE6BMX*; 20m – *R0SCA, B0CRA, B3CRA, OA9DVK, JW6VDA, XE1RK, AH6SZ, KH6HI, KH6TU, KH6OO, KH6U, BG0BPZ, numerous JAs, NH6ET, KL7ILA, KH6M, KL7TC, UA0JFG;* 30m – *DU1IST, PZ5RA*. He also comments "The most noticeable thing is the number of KH6s I worked on 20m FT8 – they and also the KL7s were all worked around breakfast-time, say 0630 to 0715UTC. Some of the FT8 signals from KH6 were decoding at around the 0dB mark so they should have been easily workable using CW." Judging by online comments, other people found the 20m KH6s and KL7s were workable on SSB at times.

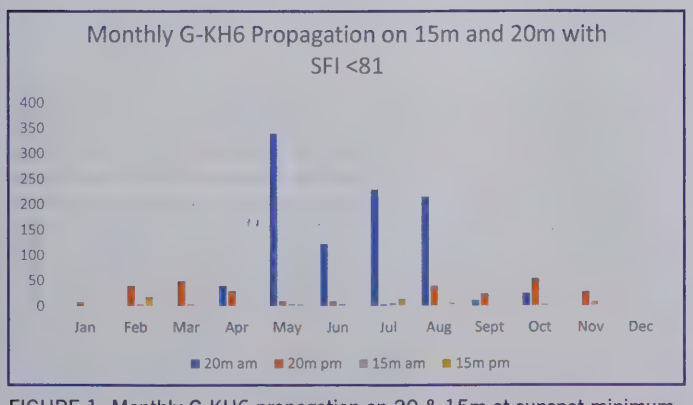


FIGURE 1: Monthly G-KH6 propagation on 20 & 15m at sunspot minimum.

Peter, G4XEX [-S] found plenty of JAs and YBs but no rare DX: 17m – *JAs*; 20m – *4S6AB, PZ5RD, YBs, VR2UNG, E24OYT, JAs, PZ5RD,* 5H3DX, 5Z4/G3AB, EL2DT.

Peter, G0VVE, was surprised to work VK2PW on 17m long path at 2200z and bagged VP8LP while beaming that way. On 20m he worked a large number of JAs over the north pole around midnight and a selection of Caribbean stations to the west: J69Z, KP3RC, CO8LY, 9Z4AH, 8P5AA, 8P6GU, 8P6CH, 6Y5FS and FS5GL.

Fred, G3SVK [LS] kept busy on CW with: 17m – TZ4AM, T6AA, 4J7SP; 20m – 5Z4/G3AB, OD5OSH, PY4JW, 8P6DR, 5H3DX, XQ6CF, VK1GR, VK2KM, HH2AA, KP4GC, TI5/N3KS; 30m – FY5FY, OX3XR; 40m – ZL3XTJ, PYs, B4CRA, KP2M, TZ4AM, HH2AA.

Graeme, M0EUK [-S] threw a simple end fed 40m halfwave antenna into a tree during lockdown and worked several dozen stations on 10m FM including FR4OM on Reunion Island.

In various email forums John, G4RCG reported a run of JAs on 17m CW around 1100-1200UTC. And David, G3WGN reported KW7Y and E2A over the WPX weekend on 10m CW.

Shaun, M0BJL wrote in about what I think were FT8 QSOs "[On 10m] the mid-morning YB/VK8 openings are still fairly reliable and today (2 May) I worked 3W1T VU2, 3B8CW and just missed a 9M2. The band is now starting to open up in the evenings and I have managed to work numerous Caribbean, Central and South American stations, J68HZ, 9Y4DG, HC1DAZ, HK6DOS, YV6KP."

## Finally

Thanks as always to my correspondents, to DX-World, 425 DX News and Daily DX.

**Martin Atherton, G3ZAY**
g3zay@btinternet.com

# VHF/UHF

**The long period of lockdown has brought many more amateurs onto the VHF bands, some returning after a long absence and some for the first time.**

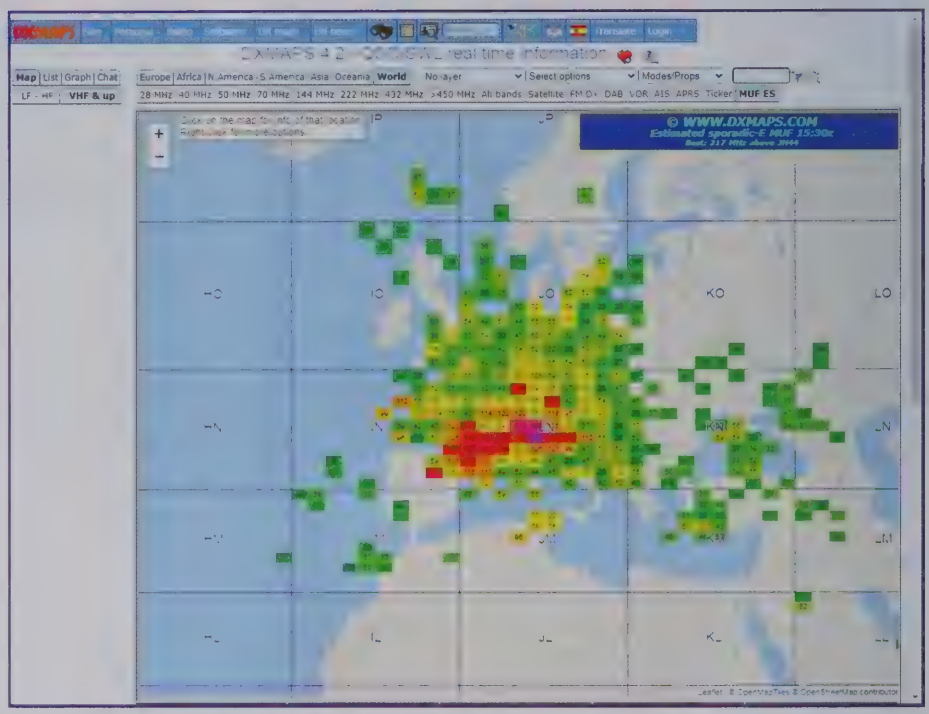
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FIGURE 1: A map at 1530UTC on 29 May showing the MUF picture above Western Europe. Note that the MUF exceeds 144MHz over a line from the Pyrenees to Austria. Courtesy of DXMAPS.com.

A common comment from both regulars and returnees is that tropospheric conditions have been poor and that many of the regular beacons, particularly on 2m and 70cm, are rarely heard. However, not everybody agrees.

Those that are well sited with larger antennas have not noticed much difference at long range. Steve, G4TRA (IO81) reports quite a number of regular 144MHz FT8 QSOs over 900km. This difference can be explained by the very low number of aircraft movements caused by the Coronavirus restrictions. Aircraft reflections from around 10km high often support paths that are obscured or unlikely due to poor low angle antenna radiation from one or both stations involved. However, despite these negative comments, May has been pretty spectacular, with long tropospheric paths along the Atlantic coast being worked by some in the south western part of the UK and many long Sporadic-E openings on all bands up to 2m.

Darrell, G0HVQ (IO81) has been very busy on 6m and he reports some of his highlights. On 11 May, the first multi hop opening, he worked PV8AZ (FJ92) in the evening. On the 18th he worked 7Z1SJ (LL25). Saudi Arabia for DXCC #153. On the 19th, Darrell worked EY8MM (MM48) Tajikistan for DXCC #154, then on the 20th he had his first 6m QSO of 2020 with the US, contacting W4AS (EL95). On 26 May, Darrell worked XV1X (OK33) Vietnam a distance of over 10,000km. On the same path he also worked UN7MAU (LO51) and UN3GX (MN83).

Richard, G4HGI (IO83) reports that his full antenna system is back and he has seen quite a bit of activity on 2m and 4m with the arrival of the Sporadic-E season during May. Richard reports these highlights of 4m DX during May: on FT8 9A6R (JN83), OK2BRD (JN99), SP9HWY (JO90), DL6AKK (JO61), DL7ULA, DL7ULM, DM2ECM (JO62), SP2FH (JO92), SP2MKO (JO93), EA8TX (IL18), EA7DL (IM87), EA1TX (IN71), EA4LU (IM68), EA5TT (IM99) and 9H1PI (JM75) on SSB.

Sporadic-E on 2m into the UK kicked off on 20 May. Many stations across the UK as far as Northern Ireland managed to work into IT9 and 9H. Darrell, G0HVQ (IO81) reports working 9H1GB, 9H1CG both JM75, IT9ZSB, IW9CTJ and IT9DBF all in JM77, all QSOs being over 2,000km. Malta 9H was a new DXCC on 2m for Darrell.

On 23 May, John, G4SWX (JO02) worked EA8CXN (IL18) at 3035km on FT8 by a combination of Sporadic-E and tropospheric ducting. He then switched to SSB and had a chat with Fernando, EA8TX (IL18) 3,050km who remained over S9 for over 10 minutes. On the 25th, in addition to a number of SV and LZ stations, John managed to work TA0LKJ (KM39) in Asiatic Turkey at just over 2,400km. On 28 May John worked a number of EA7 stations in IM76 and IM87.

Neils, G8RWG (IO91) reports that as the Sporadic-E season starts that he keeps a close eye on LiveMUF and ON4KST Chat. On 25 May, Neils worked LZ1KU (KN32AH) 2,207km, LZ1ZP (KN22ID) 2,130km and LZ2CM (KN13OO) 1,937km. All these QSOs were on SSB. Neils writes, "I quickly gave up trying to use FT8 as there was mayhem on 144.174MHz."

The Sporadic-E opening on 29 May will be remembered as one of the best ever 2m events by most stations that participated. There were enormous numbers of QSOs made during a series of events that lasted nearly continuously for over 12 hours. A picture is worth more than a thousand words, so there are two here showing different aspects of this event. These were captured around 1530UTC by John, G4SWX (JO02). The first, taken from DX Maps **[1]**, shows the calculated MUF based on Live MUF software. It can be seen that the MUF is above 144MHz in a band extending from the Pyrenees across to Austria. This resulted in most 144MHz stations in Europe experiencing an opening at the same time. Although John operated on SSB/CW for much of the time, he left a second receiver on 144.174MHz logging FT8 stations received. The second image was taken from PSK Reporter **[2]**, showing the huge spread of stations received by G4SWX in the first 6 hours of the event. John reports that he managed to work 7X2RO (JM16) with huge signals on SSB at 1530UTC. This was followed about 15 minutes later with a FT8 QSO with 7X2HF. In nearly 50 years on 144MHz this was the first time that John had worked 7X, Algeria, making it his 163rd DXCC country on the band.

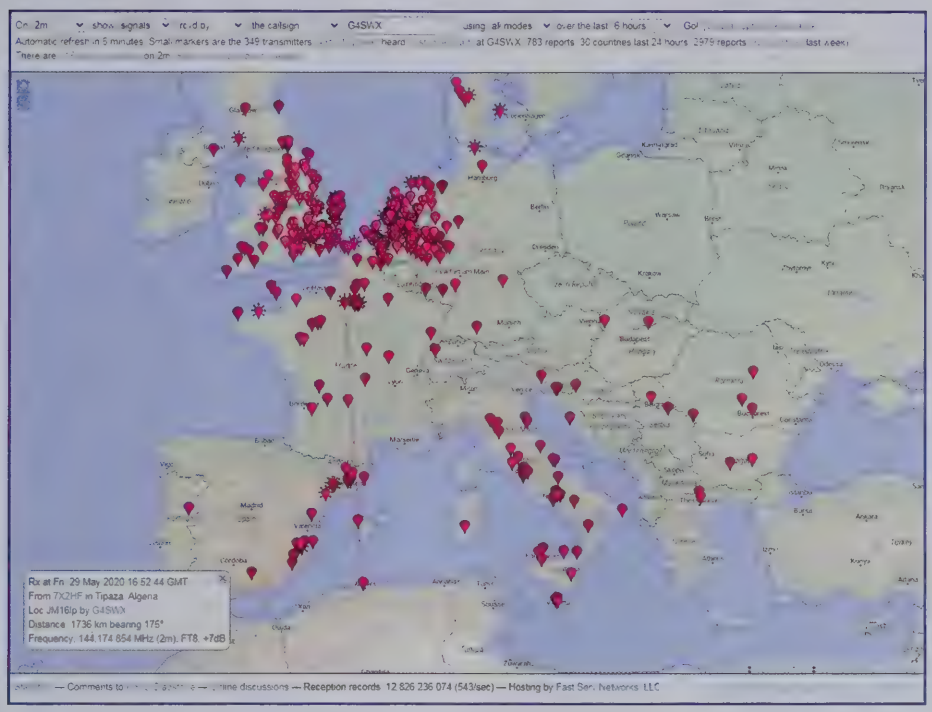
Rx at Fri 29 May 2020 16:52:44 GMT
From 7X2HF in Tipaza, Algeria
Loc JM16lp by G4SWX
Distance 1736 km bearing 175°
Frequency 144.174.854 MHz (2m) FT8 +7dB

**FIGURE 2:** A map taken from PSK Reporter showing stations heard by G4SWX 1100-1700UTC on 29 May.

Many reports have been received from stations across the UK with many of the same stations worked. Those in the south west had the benefit of a Sporadic-E plus tropo path to D4, Cape Verde Islands, in addition to the more usual EA8 and CT2 stations.

Andy, G4PIQ (JO02) writes that after 15 years' absence he has put together a small 144MHz station; 250W output with a 17-ele Tonna Yagi at 30ft AGL. He comments that a lot has changed with the arrival of the digital modes, but Sporadic-E remains as exciting as ever it was. He writes, "What an amazing opening we had on Friday 29th – all the Es all the time... At the peak, open to multiple places at the same time right from HA through YO, LZ, IT9, 9H, IS0, 7X round to EA3, 5 and 7 all at the same time. At about 1500UTC I dropped my paintbrush and managed nearly two hours of operation in the heat of the opening before domestic pressure finally won the day!" Andy worked IT9, 9H, SV, LZ, S5, YU, IS0, EA6, EA, 7X2RO and about 15 Italians, mostly on SSB.

Neils, G8RWG (IO91) commented, "I heard IT9 on FT8 in and out in the morning but the 2m band didn't really open up here until mid-afternoon. First to IT9 and 9H1, before swinging to the East for YU and 9A and then South for EA6. MUF was over 200MHz by 1700UTC – amazing stuff!"

Darrell, G0HVQ reports, "On 29 May I had Sporadic-E in the morning to IH9YMC (JM56). Then, in late afternoon, a huge opening lasting over 2.5 hours and covering most of central and southern Europe. 25 stations were worked including I, IT9, 9A, E7, YO, LZ, HA, OM and EA6. Darrell worked 5 new squares his best DX being YO6BRA (KN36), a distance of 2,160km.

Beyond the UK, particularly from parts of Europe to the East of the band of high MUF, some of 2m DX heard and worked was even more spectacular. On the Make More Miles on VHF website **[3]** there are several maps showing many of the thousands of contacts made on 29 May. Udo, DK5YA writes, "May 29 will remain in many brains since this day was one of the most remarkable when we talk about Sporadic-E. Almost 19 hours of continuous high MUF beyond 144MHz, until the very late night with last signals disappearing at 3am in Western Europe."

Some of most spectacular DX of this opening is described by EI7GL on his blog **[4]**. Here the reports logged on PSK reporter [2] have been analysed to find out who heard 144MHz FT8 signals from D4VHF (HK76) Cape Verde and who was heard by D4VHF. The longest path recorded seems to have been when the FT8 signals from D4VHF were heard by SP5XMU (KO02), a distance of just over 5,600km. Looking at the LiveMUF maps and the F5LEN tropospheric prediction maps **[5]** the propagation appears to be a combination of chordal E-layer propagation and tropospheric ducting. However, the E layer propagated part needs to be around 2,800km, making up half of the total distance! I have previously been sceptical about a mainland trans-Atlantic contact on 144MHz being possible with a single mode of propagation but the path from G4LOH (IO70) to VE1KG (FN84) is a mere 4,340km, a distance worked by quite a few European stations on 29 May.

Despite comments in last month's *RadCom* VHF/UHF column and the information being widely available online how to set up your PC/rig/software there are still some atrocious FT8 signals being transmitted. Often in the first period too, counter to the convention of most other UK operators. As a matter of course, please check your audio settings regularly. Things do change over time, particularly if you are using other software and changing the PC audio settings. Many experienced operators have also commented that FT8 is really not a very suitable mode to use during strong short-lived openings. The QRM levels are often so high that a station might only be decodable for one period in every five or so. Therefore, with the time taken to go through the FT8 sequences it is not surprising that many QSOs that have been started then fail where it could have been possible to work two or three stations in the same time period using SSB or CW.

The many weeks of Coronavirus lockdown have also seen a number of amateurs completing projects and trying new things. There have been at least 10 new UK stations spotted attempting 144MHz EME. A more regular hand at EME, Neils, G8RWG comments, "I added 9 new stations to the EME log this month including KF8MY (EN84), AG4W (EM64) and N7ZO (CN85) all near moonset on 29 May. N7ZO in Oregon was a new State for me and I have now worked a total of 42."

As we move into June it is probable that there will be many more Sporadic-E openings on all of the VHF bands so please keep sending in your reports to the *RadCom* editorial desk. With luck this will be the last VHF/UHF column that I write and I can settle back into my normal role as RSGB VHF Manager. I am hoping that a new columnist will be able to bring the enthusiasm and encouragement to others to try out different things on the VHF/UHF bands.

**Websearch**

[1] DX Maps: www.dxmaps.com/spots/mapg.php?Lan=E
[2] PSK Reporter: https://pskreporter.info/pskmap.html
[3] Make more Miles on VHF: www.mmmonvhf.de/es.php?year=2020&month=05&day=29
[4] EI7GL blog: https://ei7gl.blogspot.com/2020/05/amazing-opening-on-144-mhz-from-cape.html
[5] F5LEN Propagation Forecast: http://tropo.f5len.org/atlantic-ocean/atlantic-d4-ei/

**John Regnault, G4SWX**
radcom@rsgb.org.uk

# GHz Bands

## Keep looking up!

Fans of BBC TV's *The Sky at Night* will have heard that phrase used by the programme's presenters to encourage their viewers to look at the sky. The same phrase becomes relevant if, like me, you are sinking under a fog of terrestrial band noise at your QTH. I was further prompted to write this month's column by a tweeted photo from John @GI7UGV of his satellite antennas with the caption "Given up on earthlings, everything's for pointing up now". As GHz band antennas tend to be quite narrow beamwidth, if you can elevate them you can eliminate much of the noise that comes from the horizon. My Covid-19 lockdown projects in April and May involved pointing at the sky.

So, what's to see and or work if you point your GHz band antennas at the sky? Apart from QO-100, which has been 'done to death' in this column (and other places), or receiving commercial Ku band television satellites, what else can we see by pointing skywards?

PHOTO 1: G4BAO's 1.1m offset dish with 10GHz transverter in place.

## EME – Moonbounce

My current personal interest is small dish EME, but it doesn't have to be too difficult to at least receive *something* 'off the Moon' at 10GHz, especially for the many stations who now have QO-100 10GHz receive capability. There is a high power 10GHz beacon, DL0SHF [1] operating from Germany with a 7.2m dish pointed at the Moon and 50W of RF at 10368.025MHz. The beacon is a great introduction to the issues of GHz band EME, namely Moon tracking and dealing with large Doppler shifts on signals. The JT mode (QRA64D) transmission can be received with just an 80cm dish, an SDR Dongle and a locked satellite LNB of the type people use for QO-100. With my new 1.1m offset dish and EME transverter, the CW transmission is also easily copiable. The best way to receive it (and take out one of the variables needed to find the signal, namely Doppler shift) is to use the WSJT-X program to calculate the Moon reflected signal's Doppler shift. If you can get WSJT-X to control your receiver by CAT control (and you know your receiver's frequency error) all the better, you then simply set the program's sked frequency to 10368.024 (to produce a 1kHz tone on a USB mode receiver) and set WSJT-X to track Doppler "on DX echo" with DL0SHF's locator entered. Then you'll just need to point the dish at the Moon and track it. Full instructions on setting up WSJT-X can be found at [2]. Tracking the Moon with even a small dish is not for the faint-hearted, with less than 1° beamwidth, but for me, the GHz bands are all about such challenges. There are also a number of high powered 10GHz EME stations who will happily put up a signal for you, notably OZ1LPR who runs 400W (!) to a 2.4m dish and is just a HUGE signal on 10GHz EME.

## Deep space network (DSN) reception

If EME doesn't spark your interest, it's quite possible to receive signals from probes in deep space and there is a growing community of amateurs who are doing this. The UK 'go-to guy' for this is Paul Marsh, M0EYT, whose website [3] is a mine of practical information. I went to one of Paul's excellent UKuG Round Table talks on DSN a while back and logged it in the 'that would be interesting' part of my brain for later use. Paul's 2017 talk from the RSGB Convention is on the Society's YouTube page [4]. Much of the reception of interest is around 8.4GHz, including signals from the Mars Reconnaissance Orbiter [5].

I've recently replaced my 1.9m mesh EME dish with a smaller 1.1m solid offset type to focus on the higher bands and was surprised at how much better it was on 10GHz. Then, when I copied my first 24GHz signal off the Moon on it, I wondered 'where next?' – perhaps the relatively new DSN band at 32GHz [6]. The Bepicolombo Mercury probe [7] and the Parker Solar Probe [8] have downlink systems for this band (as well as for 8.4GHz). Parker, at least, has been detected at 168 million km (1.12 AU, that's 1.12 x the sun-earth distance) by Bertrand Pinel, F5PL on a 10ft Cassegrain feed dish [9]. His dish is designed for operation at 28GHz and is a very large setup for 32GHz, so small dish reception will be challenging! That said, it seems that this band is the future for high-data rate DSN work. It may seem bizarre to start on DSN reception at 32GHz; 8.4GHz would probably be a better place to start, but I found I had all the parts to make a 32GHz downconverter so I thought I'd build one for just the craic and initially check out what Sun and Moon noise I could measure at 32GHz. I'll publish details of the downconverter and any results.

I'm not expecting instant success with 32GHz DSN as it's hard; but it has just about every GHz bands challenge I could hope for! Weak signals, Doppler tracking, SDRs, antenna pointing and optimisation are all a challenge.

## Low earth orbit satellites

There is currently just one active L band (23cm) uplink. The one on AO92 can be accessed with a small handheld Yagi, as demonstrated by N8HM [10]. That's another possibility for space-bound GHz bands activity.

## Finally

I hope this has given you a few fresh ideas and something worth 'looking up' for. I can expand on the topics in future columns – let me know what you're interested in seeing. Email me or tweet @g4bao and @ukghz using #GHz_bands.

**Websearch**


[1] www.pa0ehg.com/dl0shf_beacon.htm
[2] https://bit.ly/2yRFE7D
[3] https://uhf-satcom.com/
[4] www.youtube.com/watch?v=p5IGK4a_uv4
[5] https://uhf-satcom.com/dsn/mars-reconnaissance-orbiter
[6] www.itu.int/pub/R-REP-SA.2167
[7] https://sci.esa.int/web/bepicolombo
[8] www.nasa.gov/content/goddard/parker-solar-probe
[9] www.nitehawk.com/f5pl/rx_32/f5pl_32_ghz.html
[10] www.youtube.com/watch?v=xSeR9I9O5Gs



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# The Slinky attic doublet

**I have built many HF and VHF aerials over the years. Previously living with a garden of nearly quarter of an acre, I had the opportunity to rig a doublet that was designed to cover from 1.8 to 28MHz.**

In its most basic form, the elements of a doublet are cut to cover the lowest frequency you intend to use. As a rule of thumb, 468 / lowest frequency = total length in feet.

Now, before going any further, I'm of a certain age. I still think in feet and inches and antenna are found on certain insects, not connected to a radio, for which I make no apology. And not being one for too much theory and formula, that's the only mathematical equation to appear in this article. In any case, aerials can't read theory, some will work in a given environment, some won't, so never be put off trying out an idea.

What puts a lot of people off using doublets? They are fed with twin feeder, also known as parallel or ladder line. Twin feeder comes in a variety of sizes; 600Ω, 400Ω and 300Ω are popular and readily available. You can easily make your own ladder line from wire and suitable plastic spacers, with many examples to be found in books and on the internet. Most aerial matching units today are designed to use 50Ω unbalanced coaxial cable for the connection between the transmitter and aerial. A doublet requires a balanced aerial matching unit (AMU). Sadly, balanced AMUs are not so common nowadays, but it is possible to make one. There are many simple designs in books and on the internet, however suitable high voltage variable capacitors are not so easy to find and can be rather expensive.

A simple solution that allows you to use a 50Ω unbalanced AMU with ladder line is to incorporate a 4:1 balun between the ladder line and AMU. **Photo 1** is of a balun I wound on a piece of two-inch diameter plastic pipe with twelve bifilar turns of ten gauge wire. Similar baluns are also available to purchase from several outlets, but why not build your own? Again, there are many examples to be found in publications and the internet.

The only requirements are a short length of plastic pipe of about 2" in diameter and wire to wind 12 bifilar turns around the pipe. The construction is shown in **Figure 1**. I secured the windings with hot melt glue and use choc block to connect the ladder line.

PHOTO 1: Homebrew 4:1 balun made from speaker cable, wound on a 2" PVC pipe. Note use of hot melt glue and choc block.

## Small spaces

Having now downsized my home and with very little garden space, I have had to make use of my attic to rig aerials. Over the years I've strung up wire aerials in a number of configurations including long wires and the 'Crown Loop' by Carl Mason, GW0VSW [1]. I've also tried a dipole made from two Slinky toys, a coil of steel that many of us will remember playing with. The Slinky dipole was, in my experience, a failure. This is not to say that it might not work for you in a favoured configuration: some swear by them, others swear *at* them.

During a clear out, I came across the two slinky coils my thoughts turned to using the them in a doublet aerial. With a length of 400Ω twin feeder to hand and using choc block connectors, the doublet (**Figure 2**) was constructed in an inverted V configuration and installed as per **Figure 3**. The two Slinkies that make up the full aerial are not self-supporting, hence string has to be run down the centre of the coils before fixing them to the feeder and anchoring point. **Photo 2** shows the result. Needless to say, do not use wire or any conducting material through the centre.

There is another worry that puts some people off using doublets. The ladder line has to be kept clear of metallic objects such as water pipes and metal window frames. But a clearance of about four inches is all that's necessary. Tying off the ladder line with lengths of string at suitable points helps to keep it clear of metallic objects.

## In use

Since rigging my slinky doublet, it has outperformed any other attic aerial I've used. Although my results are far from scientifically rigorous, I have worked the USA with 59 reports on 14MHz and most of Europe on 7MHz and 5MHz. I have very briefly tried it on 3.5MHz and although I've heard my signal via SDR sites on the internet, I've not worked any stations on this band. Yet.

I wouldn't recommend this aerial for outdoor use as Slinky coils are made of steel and prone to corrosion if left outside.

The criteria I generally apply to most of my radio projects are to keep them simple and cheap; this project fulfils both of these requirements.

PHOTO 3: Feedpoint area of my loft-mounted Slinky doublet.

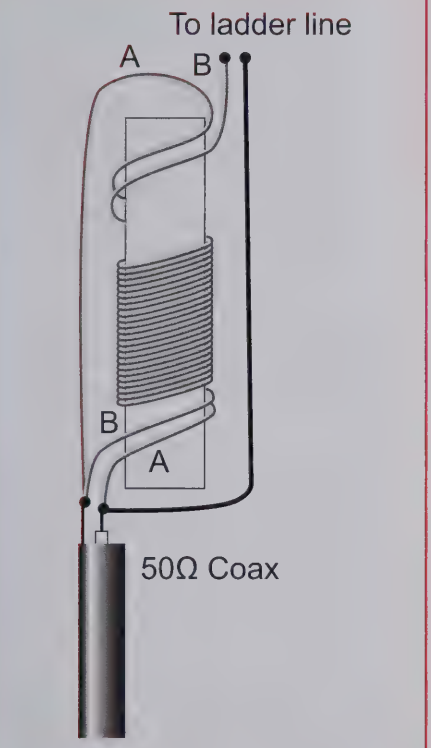



FIGURE 1: Basic constructional details for a 4:1 balun.

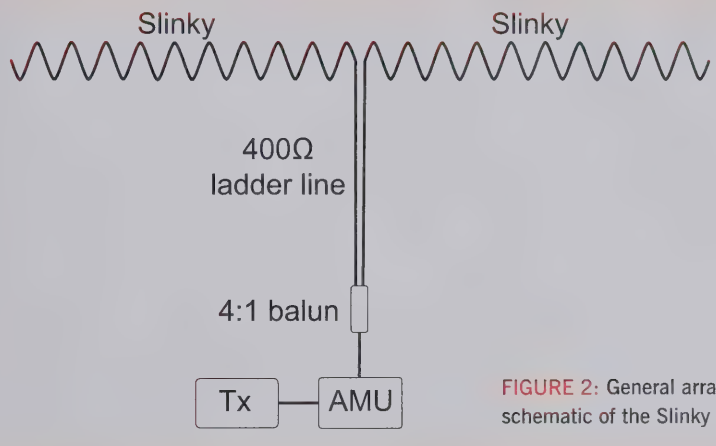



FIGURE 2: General arrangement schematic of the Slinky doublet.

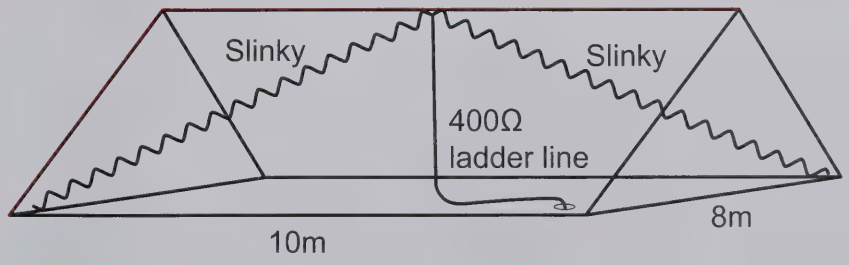



FIGURE 3: Slinky doublet arranged as an inverted-V in my loft.

*[Steel, the material from which the Slinky is made, is not renowned for its RF properties due to its skin depth characteristics; this means that antennas made from a Slinky are unlikely to be terribly efficient due to resistive losses, but they are likely to be quite benign in their bandwidth and tuning behaviour – G1MFG]*

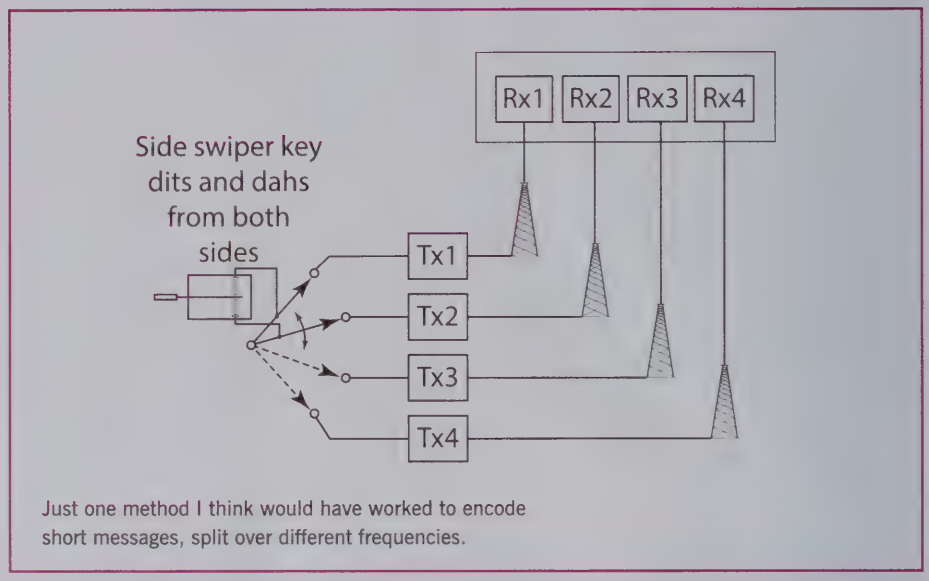
Websearch

[1] www.ve3erc.ca/crown-antenna/

**Colin Topping,**
**GM6HGW / ZD9HGW**
colinsmagic@gmx.co.uk

# An alternative to Encryption

**One day in 2017, whilst on duty in RSGB's National Radio Centre at Bletchley Park, I was asked if I had ever heard of a communication system that Germany may have trialled during WWII.**




Just one method I think would have worked to encode short messages, split over different frequencies.

The system involved sending Morse code using two keys, one for each hand. This may seem a bit awkward but, with a little practice, characters can be split between the two keys therefore a different frequency for each key could be used. Anyone listening would only get a portion of the sent character and it would not be readable unless you knew and monitored both of the frequencies in use.

Such a system, used properly, would allow short classified messages to be sent in plain language safely, where the need for speed was paramount. Using the Enigma machine was a very slow and a labour-intensive process. This idea fascinated me, so I started to give the subject more thought.

Using this system with two keys would depend on the operator making sure he did not send a whole character on one key – enter the Side Swiper or Cootie key. This key was the forerunner of the bug key and was in use as early as the beginning of the twentieth century. The following explanation is just one method that I think may have worked. There are variables. Each side of the key is wired to a rotary switch that could be motor driven. There are four transmitters, each on a different frequency or even a different band. Two of the transmitters would be in use at one time, one for each side of the Cootie key. As this type of key produces dits and dahs from either side, both signals transmitted would contain unreadable dits and dahs. When there is a pause in between words, a timer relay could rotate the transmitter selector and start using another pair of transmitters. The pause could be introduced by the operator. Anyone monitoring one of the frequencies would just hear the dits and dahs with long spacing, which would mean nothing.

At the receiver site there would be four wireless sets each monitoring the four prearranged frequencies. The operator would hear the complete signal from any two of the four receivers he/she was listening to. There are obvious shortcomings but none that could not be overcome. Tuning at the transmitter site and receiver site would be critical. The operator would have to be trained on the side swiper key and be security cleared to read the classified traffic. Propagation would play a part, but then it does in any HF transmission. The system would probably be best suited to a base station or large mobile unit, owing to the bulk of the equipment back then. I thought the best way to discuss this with people would be to make a demonstration model, which I did. Here is a link to a short demonstration, https://vimeo.com/user6859645.

I have it on very good authority that the Abwehr (Germany's intelligence service during WWII) at one point were told to listen for strange Morse type signals. They were detected but they were not told of the origin of such signals. More research was made on 'frequency hopping'. The full title being 'Frequency Hopping Spread Spectrum'.

It turns out the first person to realise there was some potential in this was none other than Marconi himself. Tesla saw something in it and Hollywood actress Hedy Lamarr is said to have invented a system to prevent the jamming of allied radio controlled torpedoes, by frequency hopping, using for switching purposes a system similar to the pianola paper roll. The 'Jacquard loom' also uses the same method for patterned weaving.

Indeed, a similar pianola type paper roll could be used to switch the Morse transmitters. At this point I thought of calling it a day on trying to find out if such a system was ever used. After all, if it had been thought of before World War One, this must be 'old hat'. But then, using the Cootie Key just makes it a bit different.

If this was used during WWII, we are looking a seventy to eighty years ago. It would have been very difficult if not impossible to monitor the HF spectrum to tie the complete signal together (so to speak). Even today, with modern equipment SDR receivers and their fast scanning capability, it would surely be a difficult task?

One line of thought is that if one of the frequencies was recorded to say a period 'inker' onto paper tape, the spaces could possibly be filled in. This would not work as the signal is being hand sent, therefore spacing would vary. Someone I spoke to with knowledge of modern systems said to me that this could easily be missed even today as the person monitoring would not know what they were looking at. And the signals are of short duration. My thoughts are that it may well have been trialled in Germany but was possibly dropped as Enigma was already in use and thought to be a secure system. Maybe there was no inclination, or the time to investigate further. Who knows?

**Peter Davies, M0PJD**
peterjdavies36@gmail.com

# Book Review

Two diverse books; a fine reference work on an oft-overlooked topic and secret pipelines.

## Transmission Lines Explained

*Feeders, Waves, Stubs and a whole lot more for Radio Amateurs*

By Mike Parkin, G0JMI

If, like me, you have for years thought that the only thing to consider on transmission lines was whether you could get away with using RG-58, this book will be a big eye-opener.

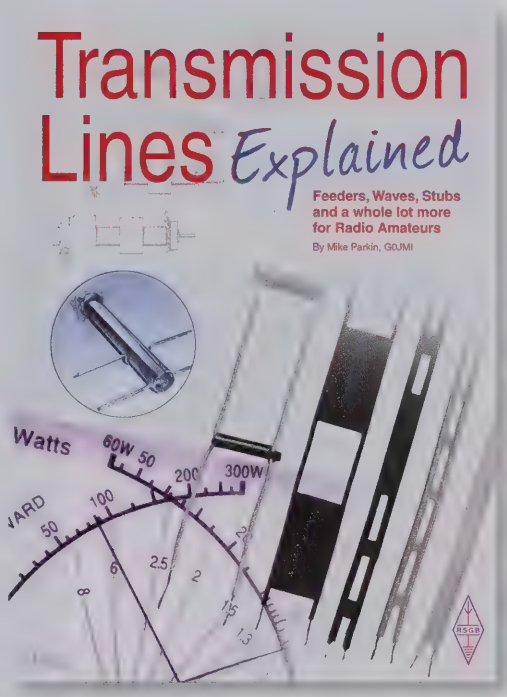
Transmission lines encompass the conductance of signals between transceiver and antenna. But what actually happens to the waves we launch along them? We want to ensure that as much of the transmitter's RF power is available for the antenna to radiate and, conversely, as much of the RF power received by the antenna is available at the receiver. We usually leave it at that, just making sure that the SWR is OK. But, as we discover, there is more to it than that.

As far as possible, this book uses descriptions rather than mathematics to support understanding. There are plenty of examples throughout, supported by clear, concise diagrams.

The most common transmission lines we see are coaxial cable and open-wire or ladder-line and these are described in some detail, explaining exactly what is going on – and why. We learn how completely separate RF currents can flow on opposite sides of the same physical piece of metal (hint: think skin depth), how this leads to common-mode problems and, importantly, how these can be solved with things like balanced-to-unbalanced (balun) transitions made from coaxial cable or ferrite materials. Leading on from this we see how one can match different impedances purely by using coaxial cable.

You'll also find an introduction to the Smith Chart and an explanation of how and why it can be your friend; a section on how to fit different common connector types to various coaxial cables, notes on the Maximum Power Transfer Theorem and some handy reference material on things like common cable characteristics and resistor values for attenuators – including details on how to calculate the necessary power ratings, something that's rarely seen.

One of the really good things about this book is that it concentrates on the 'stuff' that you really need to know about as a radio amateur. Mike Parkin has come up with a terrific book that's very accessible and an excellent balance between theory and practice. It won't be for everyone, but for those who want to understand the topic a bit more it's an excellent choice, fully justifying its place on your – or your club's – bookshelf.




**Size: 174x240mm, 136 pages. ISBN: 9781 9101 9387 7**
**Non Members: £12.99, RSGB Members: £11.04**

## Fuelling The Wars

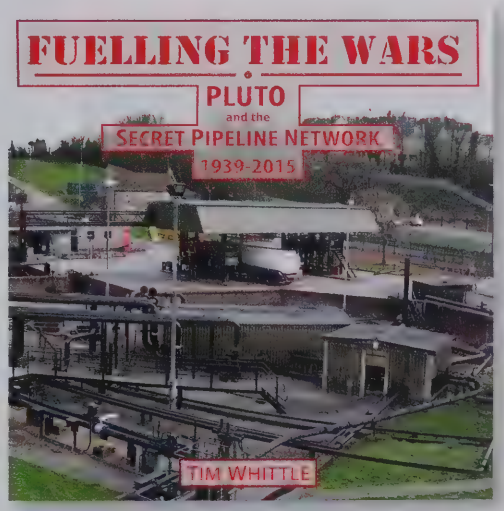
*Pluto and the Secret Pipeline Network 1939-2015*

By Tim Whittle

How to get fuel from refineries to distribution centres, airfields and so on? This harback book tracks the fascinating history of the UK Government Pipeline Storage System from its inception in 1936, through World War II and the Cold War on to the modern era, when it was sold off (in the early 2010s). It shows everything from construction, through its uses, to decommissioning.

There's much information on the wartime PLUTO cross-channel pipelines. For example, it wasn't until a few months after D-Day that fuel first flowed through PLUTO, so it had little to do with the invasion's success. We learn the whole story, with photographs and drawings showing how this mammoth project kept airfields supplied with fuel – despite requiring much more than originally envisioned in 1939. During the Cold War, the pipeline and storage facilities underwent considerable expansion, including huge, deep storage tanks at Plumley in Cheshire, inside salt cavities some 700 feet below ground. The pipelines helped fuel the 1950s and 60s boom in motoring and civil aviation. They still run beneath our feet in large parts of the UK.

Many of the photographs are large and bring to life the social history of the time. The research makes for great reading and there's lots of enjoyable 'I'd not thought of that before'.




**Size: 250x250mm, 270 pages. ISBN: 9780 9928 5546 8**
**Non Members: £24.99, RSGB Members: £19.99** (20% off)

**Giles Read, G1MFG**
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# G0HRS/A – a mini DXpedition to Devon

**In November 2019, members of Hilderstone Radio Society travelled from Kent to Devon on a short radio holiday to give the club callsign a good airing.**

Steve, 2E0KSB admiring the DX-Commander ABV (with parasitic reflector for 40m).

The plan came out of an idea that Matt, M0LMK wanted to have a long weekend away to play radio and experiment with some antennas. Realising he could do with another pair of hands to help putting up antennas, a casual comment to club members quickly turned it into a DXpedition!

After a bit of searching for suitable holiday homes with the appropriate space, one of the members mentioned that an extended family member ran a holiday cottage business near Bideford, 'it had a large field with trees and everything'. Introductions were made, quickly followed by a booking.

On Friday 15 November, two vehicles set off from Thanet to drive, well laden, down to Devon. On arrival, team members quickly went to the task of building the three operating positions. We had brought three Kenwood TS-590SG radios, one of which was enhanced with an Elecraft KPA500 linear. The intention to be active on three bands at a time and divide activity between CW, voice and datamodes. Being keen, Nigel, G4BSW set out his portable end-fed half wave antenna over the rafters of the lounge and proceeded to rattle off the first contacts of the DXpedition on CW.

That evening we sketched out our plans for building the antenna farm. Shortly after 7am the next day, the party moved out into the field behind the cottage. The first antenna erected was the end fed for 80m through 10m. This was installed as an inverted L using a guyed 12m DX wire telescopic pole but only using the lower 7m. The far end of the L was supported by a line passed over the branches of a tree on the edge of the field. The first attempt by Matt to launch the line was a little too energetic: the throw bag sailed over the desired tree and the one behind it, with the line carefully wrapping itself around a branch and holding on with a 'death grip'. The second attempt was far more restrained and sailed over the chosen limb making a quick connection for the halyard a simple task.

Second antenna was the deployment of the ZS6BKW. This is a development of the ubiquitous G5RV, being a doublet fed with ladder line of slightly different configuration. One end was supported by a halyard attached to the cottage and the centre was supported by a 12m telescopic Spiderpole, again using only about 7m. The far end was supported by a 7m SOTABEAMS tactical telescopic pole. This gave horizontal radiation, mainly NVIS due to its height.

Our antenna construction had not gone unnoticed, the local 'Rural Watch' had spotted the strange activity in the field and the owner had been notified. He knew that we were building antennas but came along anyway to see for himself. He left expressing fascination with our hobby and amazement of what we could potentially achieve with our bits of wire.

The third and final antenna build (for the moment) was the DX Commander all band vertical, but this had to be constructed from its components extracted from its shipping case. After much reference to the online construction guide (Ian, G0PDZ having forgotten to pack his printed copy) as well as quick viewing of the various YouTube videos it was all figured out, constructed and installed. The initial test was extremely disappointing, no resonance anywhere useful and very poor VSWR readings. A quick test back at the antenna base revealed all was well, checking the first length of feeder quickly identified the culprit. This coax recovered from the club cupboard visually appeared good but was obviously hiding severe issues. Scrap value was an overestimate of its price. The replacement coax showed we had a working antenna useable on all its bands, 40m-6m.

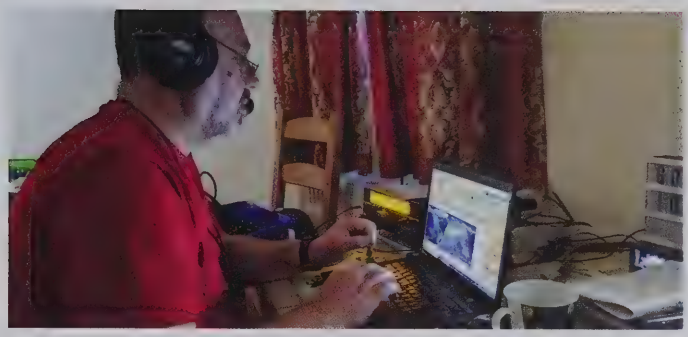
Time to put the stations on the air. By late evening, the first hundred contacts had been logged, after the sneaky four logged the previous evening by Nigel on his indoor antenna.

Sunday morning saw M0LMK first in the shack, soon followed by G0PDZ and then the others. Soon all three stations were in use and a steady stream of contacts were being made. A change was made to the end-fed half wave; it was lengthened slightly and the vertical portion pulled away from the pole to open its angle at the top where the bend from vertical to horizontal was made. An improvement in VSWR and shift in resonance was noted.

In mid-afternoon G0PDZ took command of the 80m end fed to participate in the monthly Clifton Country Club net of his old and now defunct club – Clifton ARS. As the afternoon drew to a close the adapted end fed was pressed into action on 160m with some success, but with a 'local' gap. 2E0KSB also had great fun engaging with some old friends. G4BSW ploughed on all day on the key, working the world and adding considerably to the total number of contacts. M5PGC spent time using FT8 again working some DX unavailable even to CW. By late evening we were well on our way towards four hundred contacts in the log.

It was very educational to occasionally stop transmitting and compare the received signals using different antennas on identical radios. Stations not heard on one horizontal antenna, received very weak on another horizontal but perfectly readable on the vertical or the other way around. Likewise, it was interesting to note how propagation was perceived by different antennas. On 40m, at one stage, the vertical was hearing stations in the US, Australia as well as Europe (pity they were all contest stations not interested in us!) but the horizontal antennas only were hearing the European stations. It was also a great pleasure to hear and work stations only showing as S3 on the meter as at home the noise floor routinely would mask them.

Nigel, G4BSW 'the Morse machine' in full flow.



Ian, G0PDZ, maximum concentration needed - talking and typing!

On Monday, conditions on the bands seemed to be a little lacklustre, meaning SSB contacts were not as frequent as would be desired, but some good rag chews were held – CW and FT8 kept the contact rate up.

We'd already experimented with 160m the previous night when Matt suggested removing the transformer from the end-fed half-wave and loading against the radial field. It worked a treat, with strong signals into Jersey and Scotland. But... Steve was trying to call an old friend in Cambridge and we were barely readable to him – the shallower take-off angle of the end-fed was causing us to skip right over his head. We needed something a bit more NVIS for what in Top Band terms is 'local'.

Many Top Band operators Steve knows use an end-fed wire with some added capacitance malarkey and a bunch of counterpoise underneath, but almost everyone we spoke to said the same thing: if you've got the room for a dipole, put up a dipole. If it's low-slung (that's under 40-60ft for the 160m band) it'll propagate straight up and give you better local coverage (that's a few to several hundred miles at 160m).

We endeavoured to construct a full-sized Top Band dipole, 80m span. Matt had a 40m dipole that we extended using a spare reel of wire that Steve had brought. We attached the additional lengths at the convenient anchor points on the ends of the 40m dipole and slung the whole thing between two trees at the top and bottom of the field (thanks once again to Matt's superlative arboreal tossing skills). Although we'd been told that 40-60ft elevation would be ideal, we didn't have anything that would take it that up that far, so we went as high in the trees as we could and used a 10m push-up pole to raise the centre feed point.

The feed point was a fair way down the field, and the whole thing was nearly scuppered when we discovered the other spare feeder we'd brought along from the club was also unserviceable. Phil, M5PGC saved the day by producing a decent length of nice-quality cable that reached up as far as the base of the end-fed half-wave, so we switched between the end-fed and the 160m dipole with a brief trudge across the top of the field. We still got our favourable reports in the extremities but were now being heard nicely in England too. Steve, 2E0KSB worked a number of stations on SSB and received several compliments on our station. The antenna was also used by Nigel, who enjoyed the opportunity to work some Top Band CW contacts. Thirty-four FT8 contacts were also made on 160m. For many people getting an efficient radiator on 160m is a tough call as antennas that fit into the average garden have to be pretty exotic. It was amazing to have enough space to build a simple antenna that works really well on the band.

Tuesday was our final full day and the three radios were kept in action from early morning. Due to the weather we started dismantling the antenna farm during the afternoon as heavy rain and high winds were forecast overnight. Everything except the DX Commander was dismantled and packed away by the time dusk fell. One additional antenna was erected, a SOTABEAMS linked dipole supported by a tree at one end and the cottage at the other. This was to allow some testing of an Icom IC-7100 and laptop on FT8.

Wednesday was a wet and distinctly gusty dawn. The DX Commander survived the night, despite its minimal guying – but was knocked over as we breakfasted.

All in all, we achieved our purpose of getting the club callsign out on the air.

## Logging

We had discussed logging options prior to the trip and decided upon Log4OM as our logging solution as members had plenty of experience using it and it had some very exciting options for sharing a single database while logging on several active stations simultaneously.

Steve and Matt ran some tests before the trip to check the theory, simulating setups based on both a locally-hosted database (on a PC on the same network as all the workstations) and a cloud-hosted database. Both tested fine so we had options for the live installation, depending on how the internet at cottage was configured.

The Guest Wi-Fi at the cottage proved adequate for most of our needs, but it was slow and vulnerable to outages. Individual connections to it were isolated from each other for security, which meant we'd have to use a cloud-hosted database, but the regular internet outages were causing Log4OM to lose its database connection. Phil saved the day with a 4G mobile hotspot from EE, which gave us a fast, reliable connection with proper local networking. We connected our workstations to this and the new locally-hosted database.

Each HF station had its own PC workstation running Log4OM, where each operator would sign in under his own callsign when taking over control of that station. All previous logs entries were visible at all workstations, which meant every operator was able to see where each other was working. Each logged contact was also sent to QRZ.com in real time.

To make things easier, we intend to build a Raspberry Pi-based solution that will provide connection to 4G, create a local Wi-Fi network and also host the SQL database for the logging software, giving us a portable plug-in-and-play network box for future outings.

### Statistics

Total = 705 QSOs
CW = 287 QSOs
SSB = 125 QSOs
FT8 = 295 QSOs
SSTV = 2 QSOs

### Antennas

| | |
|---|---|
| 80m end fed | 80m – 10m (adaptable as ¼ wave on Top Band) |
| ZS6BKW | 80m – 10m |
| DX Commander | 40m – 6m (will be adapted to add 80m) |
| Top Band dipole | 160m (adapted from 40m dipole) |
| Linked dipole | 40m, 15m, 12m, 10m |
| Flowerpot | 2m |
| VHF/UHF log periodic | 2m-70cm (Satellite antenna, not used) |

Ian Lowe, G0PDZ
g0pdz.ian@gmail.com

# History, Satellites, Microwaves, VHF

## Getting started in EME

*Earth - Moon - Earth Transmissions*

By Stephen Appleyard, G3PND and Philip Malme, G4PQP

Bouncing signals off the Moon has always been considered the most difficult of the amateur radio disciplines. Moonbounce was practised by amateurs who were the most accomplished engineers and operators, but recent developments have made it more accessible. *Getting started in EME* sets out to explain what you need to know.

*Getting started in EME* sets out the history of Moonbounce, gives information on the various EME bands and the reasons for choosing them and then explains the EME signal path. It covers the unique propagation effects such as libration fading, Faraday rotation and spatial offset. Ground gain, Doppler shift and degradation are also covered. The book is practically based and focuses on EME at 144MHz (2m) and proposes, wherever possible, the use of equipment that is already owned, in order to reduce the cost of getting started in EME.

If you have never tried EME transmissions or are just interested in what it takes to make that first contact made by bouncing a signal off the Moon then *Getting started in EME* is the ideal introduction

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**ISBN: 9781 9101 9369 3**
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## Restoring Old Radio Sets

By Philip Lawson, G4FCL

For many there is nothing more charming than an old broadcast receiver glowing away in a wooden or Bakelite case. However these are now a rarity and it is much more likely that old radio sets will be non-working curios found at car boot sale. *Restoring Old Radio Sets* sets out to provide a step-by-step guide to bringing an old set back to life, getting it working properly, and restoring its looks.

You will find topics that include cleaning methods for electrical and mechanical parts, making typical electrical repairs and the process for performing live tests. There are sections on fault-finding methods and alignment & calibration of the working set. There are even useful guides to one of the major keys to completing a successful restoration - knowing how to treat the cabinet, be that - wood, Bakelite, or plastic. The tools, materials, and techniques needed for your restoration are all discussed along with the care and maintenance of the finished item. Safety issues are not forgotten and the hazards inherent in such a restoration are discussed.

*Restoring Old Radio Sets* provides a fascinating insight into the world of radio set restoration. This book is aimed at someone with basic knowledge of electronics but wishes restore an old set.

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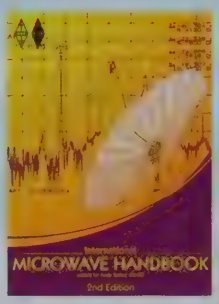


## International Microwave Handbook

*2nd Edition*

Edited by Andy Barter, G8ATD

The microwave bands are a popular part of the amateur radio spectrum. They provide the space to experiment with many of the modern modes of transmission and, with the availability of high performance components, kits and ready built units.

The RSGB in partnership with the ARRL has produced this second edition of this *International Microwave Handbook*. This book provides reference information and designs from around the world of microwaves. Material has been drawn from many sources including *RadCom*, *QST* and *QEX*. Alongside this, a truly international range of material from radio amateurs has been sourced.The book contains invaluable reference material for those who want to understand these exciting bands.

The fundamental principles used to design and construct equipment for the microwave bands are all covered. Techniques and devices lead the reader to understand the wide range of modern components and equipment available that can reasonably be used by radio amateurs.

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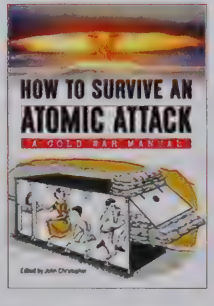


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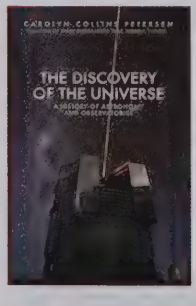


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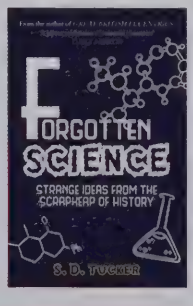


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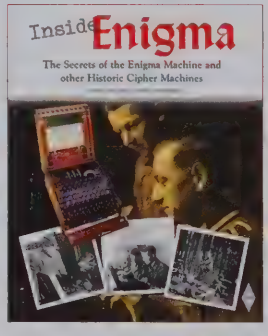


## Inside Enigma

*The Secrets of the Enigma Machine and other Historic Cipher Machines*

By Prof. Tom Perera, W1TP & Dan Perera

Many have heard about the Enigma machines of WWII but few have an understanding of the history of these impressive machines, how they work or went on to be developed. This fully updated second edition of Inside Enigma provides in depth detail on how these machines worked and why the even though the codes proved breakable that developments of this machine remained in service for many years after the war finished.

If you want a book covering the secrets, theory and practice of the Enigma Machine in the 20th Century then Inside Enigma provides the ideal source.

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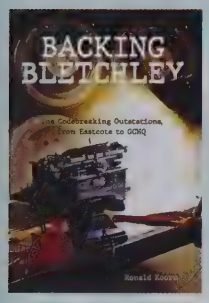
# UHF & Short Wave Listener




## Backing Bletchley

*The Codebreaking Outstations, From Eastcote to GCHQ*

By Ronald Koorm

This new hardback book, *Backing Bletchley,* takes an entirely new view of the WWII codebreaking operations - the rarely told story of the outstations that supported and complemented Bletchley Park. Well known for his codebreaking lectures, author Ronald Koorm explores the Y-stations, Wavendon, Gayhurst Manor, Adstock, Drayton Parslow, Letchworth, Stanmore and Dollis Hill that, after the war, evolved into today's GCHQ .

*Backing Bletchley* explores the complex relationship between Bletchley Park and its support codebreaking outstations, the background to the Enigma encoding machine and how Eastcote became the largest codebreaking outstation during the war. He analyses the development of improvements on Alan Turing's Bombe machine, the contribution of the WRNS (Wrens) in operating the machines and some of the social history showing how those Wrens, from varying social backgrounds, displayed outstanding teamwork under immense pressure at the codebreaking sites.

*Backing Bletchley* sets out, in a clear and very readable fashion, the complex interrelationship between Bletchley Park, its outstations and supporting infrastructure. It is a treasure-trove of information and thoroughly recommend for those interested in WWII code breaking.

**156x234mm, 288 pages**
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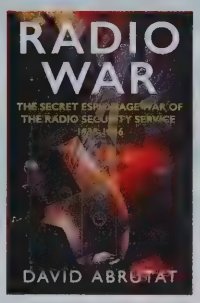


## Radio War

*The Secret Espionage War of the Radio Security Service 1938-1946*

By David Abrutat

If you have every wondered what Radio Amateurs did during WW2, then this new book will be a revelation. Many books have described the work of Bletchley Park and even the work of GCHQ and SIGNIT but *Radio War* extends this into the work carried out by that voluntary interceptors (VI) many of whom were radio amateurs and RSGB members. It does not stop there either as it describes the secret operations, the stations used and so much more.

During the Second World War German intelligence had deployed wireless teams throughout occupied Europe. Agents had even been deployed to mainland Britain to spy on British military activity. Monitoring and reporting of their wireless transmissions fell to a small, secretive and largely unknown unit manned almost exclusively by volunteers. The VIs would spend hours every day at home monitoring the short wavelengths for often faint and difficult to copy signals transmitted by these German secret intelligence services. This unit was to become known as the Radio Security Service (RSS) and was at the core of the signals intelligence production effort at Bletchley and the insights into German military tactical and strategic planning.

This book is a truly exceptional insight into the activity of the RSS, radio amateurs in WW2 and much more. It is thoroughly recommended reading.

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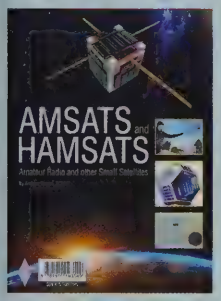


## Amsats and Hamsats

*Amateur Radio and other Small Satellites*

By Andrew Barron, ZL3DW

This book is simply the most comprehensive guide available on how you communicate through amateur radio satellites and how to receive signals from other small satellites and 'weather' satellites. Written by best-selling amateur radio author Andrew Barron, ZL3DW this is the answer to everything you wanted to know about this exciting world of satellites.

*Amsats and Hamsats* begins by answering questions like, 'how do satellites stay in orbit' and 'why are they so expensive to launch?' before moving onto sections about the history of amateur radio satellites, the mathematics governing orbits, different types of satellite and their orbits. It covers the equipment you need, to track and use the amateur satellites and some of the satellite tracking software that is available. There are detailed sections covering feeders, masthead preamplifiers, antenna systems and automated rotator control. There are the details of FUN cube Satellites, Weather Satellites and even the International Space Station. If you want to know the art of the possible and what satellites are available, where they are, new ones that are planned and even the bands you can operate, *Amsats and Hamsats* has the answer. There is much more included and this book provides the ultimate guide to operating satellites.

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## ARRL Amateur Radio Satellites for Beginners

*Outer Space is Your Next Radio Frontier!*

By Steve Ford, WB8IMY

Sputnik was the first man made satellite to make it to orbit in late 1957 yet only four years later the first dedicated amateur radio satellite also reached orbit. Ever since that 'Oscar 1' radio amateurs have been launching and using their own satellites. This new ARRL book *Amateur Radio Satellites for Beginners* looks at what the beginner can do with these satellites and much more.

*Amateur Radio Satellites for Beginners* explains how you can make contacts through amateur radio satellites, using equipment you probably own already. This book is your guide to what is required to enjoy this type of operating. It will enable you to locate satellites and determine when they will be available in orbit. There are also tips for building your own "satellite station" and satellite antenna projects you can build at home. There is a simple step-by-step guide to making your first contacts with a simple a set up as a dual-band FM transceiver and a mobile antenna.

There are dozens of spacecraft in orbit just waiting for your signals, and more are being launched every year. *Amateur Radio Satellites for Beginners* can introduce you to these new experiences that you may have thought were out of your reach.

**Size: 184x227mm, 124 pages**
**ISBN: 9781 6259 5130 4**
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# Versatile voltage detector with LED indicators

What's the charge level on your battery? How's the output voltage of your power supply or even your audio? These are just a few examples of voltages that would be nice to know about. It's not always practical, though, to tie up a voltmeter or oscilloscope to keep track of routine voltage monitoring, especially when test equipment is needed for more urgent or important tasks like calibrating or trouble-shooting active projects on the workbench. What to do?

I discovered in a previous project that in open-loop gain an operational amplifier (opamp) will act like a switch in that the output will swing from +V to very close (but not actually) to 0V when one input goes either above or below the reference point of the other input. Whether the output goes high or low depends upon whether the + or – input is chosen for the reference. Since we want a LED to turn on once a certain voltage is reached or exceeded (a voltage applied to the SENSE input on **Figure 1**), we'll use the – input of the opamp as a reference voltage (set by the potentiometer shown in the schematic). The potentiometer wiper arm is adjusted with a voltmeter; once the voltage on the SENSE line exceeds the voltage set by the potentiometer the associated LED will light.

There are few things of note that happen between the opamp and LED. For example I've noticed that while the output of an opamp will get very close to (if not exactly to) +V on its output, the opamps I experimented with only go down to approximately 3V instead of all the way down to 0V (although some 'rail-to-rail' opamps *are* available, I didn't have any). To cure this problem and turn this into a purely digital circuit I added a Schmitt trigger/inverter after the opamp. At this point you might ask, why not use a Schmitt trigger in the first place and skip the opamp? In reading over the specifications of the Schmitt trigger I found that the input voltage at which it will trigger is fixed – it can't be varied over a range of input voltages (as we're doing with the opamps).

The reason for the second inverter (after the Schmitt trigger) is to maintain a positive logic level (ie a logic 1 = +V), which then turns on the LED driver circuit (transistor and associated resistors) and the LED itself. Resistor values shown are based on a +13.8V supply and 2V/20mA LEDs.

All of this worked quite well in my previous project, so I tried using multiple versions of the circuit in parallel (as per **Figure 2**) – actually, six

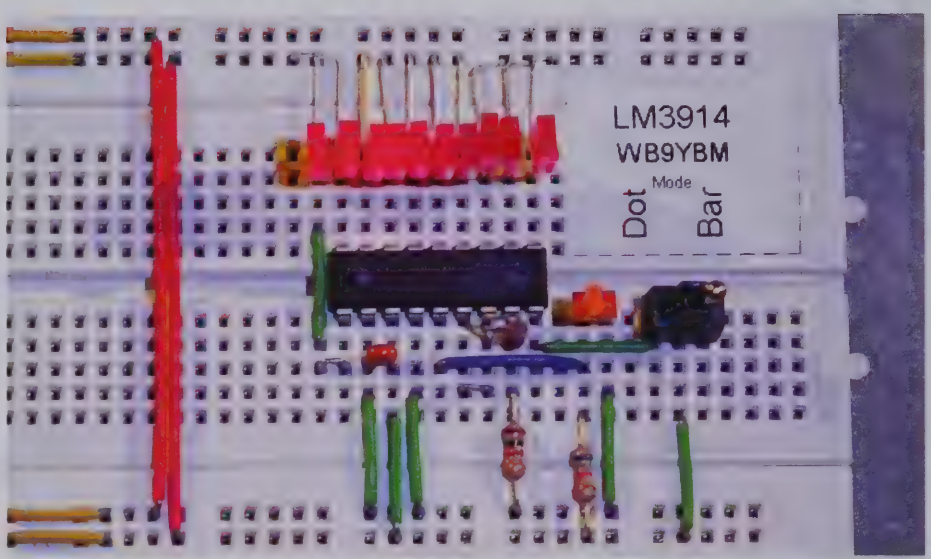


PHOTO 1: Prototype versatile voltage detector circuit. The orange LED just provides a test voltage.

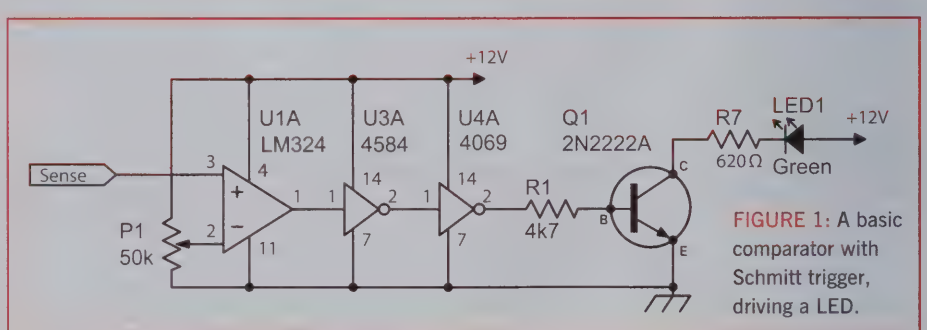


FIGURE 1: A basic comparator with Schmitt trigger, driving a LED.

circuits, though for brevity just three are shown. Unfortunately, when these circuits were hooked in parallel, with each reference input set to a different value, the circuit did not function. Thinking that a problem was caused by an interaction between IC inputs, I attempted to isolate each opamp input from the others (without isolating from the SENSE line) with a signal diode (**Figure 3**). Still, the problem persisted. In fact, the test circuit behaved as though nothing at all had been changed.

This led to my attacking the problem on two separate fronts. I was loath to give up entirely on my initial idea – it *seemed* viable, at least in principle – and I didn't want all the hours already invested to have been for nothing. So I passed the circuit around to some electronically-minded friends, licensed and not, in the hope that more sets of eyes might yield a solution. But no such luck.

## A different approach

Fortunately the possibility of having to use a totally different approach had crossed my mind as well, so I also asked my friends, "what options do I have?" This led to my discovering the venerable LM3914 series of bargraph ICs, comprising the LM3914 (linear display), LM3915 (30dB range in 3dB steps) and LM3916 (logarithmic/VU meter). I chose the LM3914 for this application since I wanted a straightforward linear voltmeter.

This IC can be used in several different configurations, including an expanded scale

Klaus Spies, WB9YBM
wb9ybm1@yahoo.com

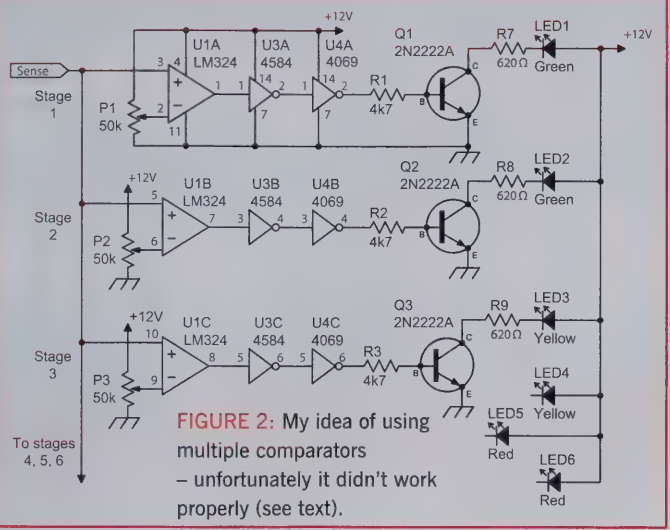


FIGURE 2: My idea of using multiple comparators – unfortunately it didn't work properly (see text).

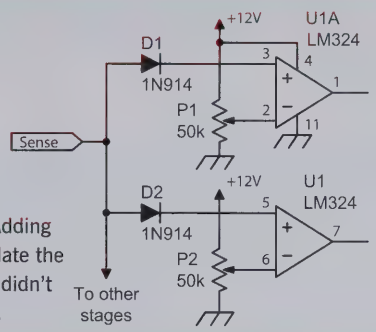


FIGURE 3: Adding diodes to isolate the comparators didn't help matters.

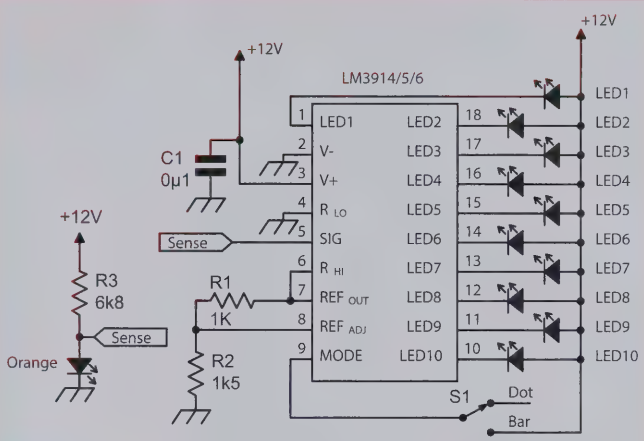


FIGURE 4: Success: the LM3914 is an all-in-one bargraph driver IC that requires very few external components.

version for car battery checking, making it a very versatile device. (There are many other circuit configurations mentioned in the datasheet and on the internet, so there's no shortage of possible applications). **Figure 4** shows a basic application circuit that I duplicated on my bench to make sure everything operates as described. (Resistor R3 and the orange LED aren't really part of the circuit, but were included when I built this circuit, seen in Photo 1, to provide a handy input voltage for testing – a variable resistor might have been a better option but I didn't have one to hand).

Included in the versatile characteristics of the LM3914 is on-board current limiting of LEDs. The data sheet says the LED current in mA is 12.2/R1 (in Ω). Also mentioned is the need for a bypass capacitor (C1) if lead lengths are more than about 150mm, to avoid oscillations in the IC.

There are far too many different ways that this IC can be used to be able to cover everything in a single magazine article, so I encourage others to explore further project details for themselves. The datasheet [1] makes very interesting reading and contains a number of sample circuits.

Here are just a few of the capabilities of the LM3914/5/6:

- A single pin switches between moving dot and bargraph mode
- It's very easy to set up the voltage range
- The IC can measure up to within approximately 2V of +V
- If more resolution is wanted, the devices can be cascaded
- A full scale alarm can easily be added (including making the top segment flash at full scale with minimal extra components)
- Wide supply range – 3V to 24V
- Compatible with TTL and CMOS

For initial tests, I wanted to keep the test circuit as simple as possible to avoid confusion, leading me to build and test circuit shown. It worked as described, although I was surprised at one point during the testing. I used both +5V and +12V supply voltages and found that in both cases the voltages at which the LEDs lit were the same regardless of the supply, thanks to the IC's internal voltage reference.

The datasheet includes simple formulae to calculate the component values to determine the range of voltages that can be measured/calibrated to provide maximum display at whatever maximum voltage you want (subject to some sensible limits), plus of course how to calculate the LED current, offset scales, centre-zero and much more.

## Sustainability

One concern I have in project building is sustainability: are parts available from multiple sources so that if one manufacturer decides to discontinue a given part, will it be available from someone else? This is a two-fold concern in that others will need to be able to get the parts for their own build and – even though modern components don't become defective as often as those made with older technology – eventually, replacements may be needed. Fortunately I've found data sheets for the LM3914 from at least two manufacturers: Texas Instruments and National Semiconductor. The IC is so useful that it has been available for four decades and shows no signs of disappearing anytime soon. Even if production stopped tomorrow, enough have been made that the world won't run short anytime soon.

## Construction

Actual construction is not critical insofar as we're not dealing with any high impedances that might be susceptible to stray RF and only standard low voltages found on test benches (this will operate as easily with +12V as with +5V). The only thing to really watch for is current consumption: make sure the power supply for this circuit can handle all of the LEDs being lit (especially in bar graph mode). If there's a risk of noise (or RF) on the input voltage it's probably worth putting a suitable capacitor from it to ground – and, as already mentioned, it's a good idea to put a capacitor (C1) across the supply in order to ensure stability.

## Conclusion

I'm glad I found this IC, albeit a good few years after its introduction. It's inexpensive, versatile, robust and more or less bomb-proof: I can see myself using it in all sorts of applications in the future.

**Websearch**

[1] www.ti.com/lit/ds/symlink/lm3914.pdf

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# Signal and Noise and all that

Every radio amateur who has ever listened for signals knows about noise. It is that quiet hissing in the background of a very strong local signal (gain turned down), or the loud roar obscuring a weak DX signal (gain turned up); it is the limiting factor in our ability to make contacts over the air. In principle, if the noise power was zero, it would not matter how weak the received signal was: we would be able to hear it perfectly. In practice, we have to live with noise. Some is generated in the circuitry of our radio; some is naturally occurring 'sky noise'; some is generated locally by everyone's electronic devices, especially switching power supplies, routers, VDSL and so forth. Having done your best to eliminate as much as possible, you are left with a residual noise level. It is unwanted, it is annoying, but it is a fact of life.

FIGURE 1: A screen capture of the output from G4ILO's excellent VOAProp program.

So what is noise? I am not referring here to interference from other stations on the channel, but to random variations in the voltage presented at your receiver's antenna terminals. Within a relatively-narrow channel bandwidth of a few kHz, the spectrum of the noise is usually 'flat', that is the power per unit bandwidth is constant across the channel. The total noise power in the channel, ie the reading on your S-meter when not receiving any signals, is proportional to the bandwidth. Narrow this down and the noise power correspondingly decreases. If you have an SDR receiver, you can verify that the noise power decreases in proportion to the bandwidth for yourself as SDR software usually allows the bandwidth to be changed in a precise fashion. To see this in practice, tune to a part of any band where there are no signals, just noise. Set the bandwidth to, say, 5kHz and note the S-meter reading. Now reduce the bandwidth by a factor of four to 1.25kHz. You should see the S-meter reading decrease by one S-point, showing that the noise power has decreased by 6dB (a factor of four).

The ratio of the signal power to the noise power in the receiver channel is the measure that determines whether or not you can make a contact (in the absence of co-channel interference). This is usually called the 'signal-to-noise-ratio' (SNR for short). We can argue about what SNR is required for 'good copy', but as a rough guide I am adopting a ten-to-one figure whereby the signal power needs to be at least ten times the noise power (ie an SNR of at least 10dB). You can, of course, make contacts with lower levels than this, especially using a digital mode, but with increasing difficulty as the SNR decreases. Note that, for best results, the effective channel bandwidth needs to be no greater than that required to receive the signals. Make it wider, and the noise power increases but the signal power does not. By 'effective channel bandwidth', I don't just mean the setting of the RF bandwidth on your radio. There is often additional processing going on that narrows the bandwidth further, either in a computer in the case of digital modes, or in your ear's ability to pick out speech patterns or tones buried in the noise. For example, I am receiving WSPR signals on 20 metres as I write this. My trusty TS-480 has an RF bandwidth of about 2kHz, but the processing going on in the WSJT-X software reduces this to about 6Hz.

## Analogue modes

There are three factors that affect the SNR required for good reception. The first two affect all modes, while the third affects only the digital modes. The first factor is the minimum bandwidth needed to receive the signals. The noise power within a given bandwidth is proportional to the bandwidth, so that a mode requiring a narrower bandwidth in order to receive the signals

TABLE 1: Indicative values of parameters affecting the performance of some modes.

| Mode | BW (Hz) | Wasted power (%) | Information bits per message | Message length (s) | Max possible bit rate (/s) | Equivalent no of versions (/message) | Gain (dB)§ | Signal level for 10dB SNR† |
|---|---|---|---|---|---|---|---|---|
| AM | 5000 | 75 | - | - | - | - | -9 | S 8 |
| SSB | 2500 | 0 | - | - | - | - | 0 | S 6-7 |
| CW | 100 | 0 | - | - | 50 | 1 | 14 | S 4-5 |
| FT8 | 50 | 0 | 77 | 12.5 | 25 | 4 | 23 | S 2 |
| JT65A | 180 | 0 | 72 | 47 | 90 | 59 | 29 | S 1-2 |
| WSPR | 6 | 0 | 50 | 112 | 3 | 7 | 34 | S 1 |

§ relative to SSB  † with a noise level of S 5 in 2500Hz

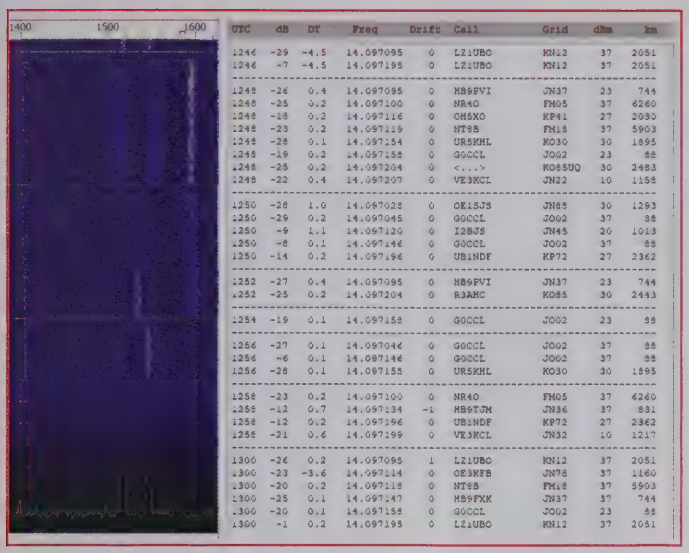



FIGURE 2: A screen shot of the output from Joe Taylor's WSJT-X program.

will have a lower noise power in the channel than one requiring a wider bandwidth. Thus modes that occupy narrower bandwidths are intrinsically more sensitive, provided that the bandwidth is reduced to the minimum required to receive the signals.

The second factor that needs to be taken into account is whether the mode wastes power in elements that convey no information. This is most obviously illustrated by amplitude modulation (AM), where the information content is divided equally between the upper and lower sidebands (I am assuming a mono signal) and the carrier conveys no information at all. Half of the total power is in the carrier, and a quarter in each sideband, so this mode 'wastes' 75% of the total power. Single sideband (SSB), on the other hand, uses only one or other of the sidebands, so is four times more effective in its use of the power. The bandwidth of the SSB signal is also half as wide as that needed for AM, so the minimum noise power in an SSB channel is half that in an AM channel. These two factors together mean that an SSB signal can be about one and a half S-points (9dB) weaker than an AM signal for the same degree of 'good copy'.

These two factors affect all modes, both digital and analogue. Parameters for two analogue modes, AM and SSB, are shown in the top two rows of **Table 1**. I have made the assumption that the audio signals are entirely confined within a bandwidth of 2500Hz, so the minimum RF bandwidth required to receive signals is 2500Hz for SSB and 5000Hz for AM. These are the figures shown in second column labelled BW (Hz). The third column shows the percentage of the total transmitted power that is wasted, 75% for AM and zero for SSB and the digital modes. The penultimate column, labelled Gain (dB) illustrates the effectiveness of the mode relative to SSB. AM is 8 times worse (-9dB) than SSB, as previously discussed, meaning that AM signals would need to be 8 times stronger in power than SSB signals for 'good copy'. I have a noise level of S5 on the 20 metre band at my home QTH, so I would need AM signals to be 19dB stronger than this, ie S8, for good copy. SSB signals, on the other hand, could be received at S6-7 for the same degree of 'good copy'

## Digital modes

We can argue about whether CW is an analogue or digital mode, but I have chosen to put it with the digital modes in Table 1 because it uses a very special computer to decode the signals – your brain. Tests in various laboratories have shown that the human ear (plus brain) is capable of detecting pure tones buried in noise at a level that would be equivalent to a bandwidth of about 100Hz. I measured this myself some years ago. My subject sat in a chair facing away from me wearing a pair of earphones fed with noise extending from 100Hz to several kHz. At random intervals I added a pure tone of 800Hz lasting about 1 second. The subject was asked to raise a hand whenever they heard the tone. I gradually decreased the signal level of the tone until the subject was no longer able to detect the presence of the tone reliably. The test indicated that the equivalent noise bandwidth of his ear-brain combination was between 50 and 100Hz. The effective bandwidth of CW is therefore about 100Hz, giving a gain over SSB of about 2500/100 = 25, or about 14dB. I should therefore expect to be able to read CW with 'good copy' at strengths between S4 and S5 in my shack.

The third factor that needs to be taken into account affects other digital modes only. The data bits are spread out so that the same amount of information is sent in a single block over a longer time. The data bits are extracted once the whole block has been received. There are many clever ways of doing this, but we can get an idea of the gain we might achieve by considering the simple example of repeating the message several times in the block. Note that none of the modes listed in Table 1 do this, but it is worthwhile considering this method as it allows us to quantify approximately the benefit, or 'processing gain', we might expect from spreading the information over a block that is longer than that required to accommodate just the data bits. On decoding, an algorithm decides the value of each data bit by comparing the several versions received. Suppose that the data are sent twice in the block. We might expect to find, on average, that the error rate is halved; more generally, it is reduced in proportion to the number of versions. The processing gain is therefore equal to the number of versions, ie 6dB for packets containing four versions of the data.

In making the estimate of the processing gain, we must take into account the bandwidth occupied by the digital signal. The Shannon-Hartley theorem provides us with a formula for the maximum theoretical rate at which data can be sent. This depends on the SNR as well as the bandwidth. Here we will adopt the notion that the fastest possible rate at which the data can be sent corresponds very roughly to about half the bandwidth, ie BW/2 bits per second. (Note that when the SNR value is very large, the maximum possible bit rate can be many times the bandwidth, but in those circumstances we wouldn't be bothering with using this sort of digital mode!) This sets the maximum number of bits that could have been sent in a given block lasting T seconds, as T times BW/2 bits. Let's take the WSPR protocol (bottom row in Table 1) as an example. The bandwidth required by the actual WSPR signal is about 6Hz, meaning that in theory the maximum bit rate would be 3 bits per second. The block contains just 50 bits of data, comprising the callsign, Maidenhead locator and signal power. The 50 bits could therefore be sent in a time of 50/3 = 16.67 seconds, so within the block, which takes a total time of 112 seconds to receive, there could (in principle) be 112/16.67 = 6.7 versions of the data bits. The processing gain of 6.7 corresponds to about 8dB. The narrow bandwidth also means that there would be 2500/6 times less noise power in the channel, so the total gain in using WSPR over using SSB would be 6.7x2500/6 = 2792, or about 34dB. So using our criterion of 10dB SNR for 'good copy', we would expect easily to be able to use signals about 24dB weaker than SSB, ie about 4 S-points lower.

Of course, the actual way in which the data bits are packed and spread over the WSPR block is much more sophisticated than

**Peter Duffett-Smith, G3XJE**
pjds@mrao.cam.ac.uk

FIGURE 3: A screen shot of the decoded WSPR stations shown in Figure 2.

merely repeating the data. This is how it is done in practice. To the 50 information bits are added a further 50 error-correcting bits. The resulting 100 bits are spread out ("convolutional encoding") over 162 bits. The order of these bits is then mixed up by interleaving. To each of the 162 bits is then added another 'synchronisation bit' giving a total of 324 bits. Each pair of bits represents the number 0, 1, 2, or 3 and is transmitted as one of four corresponding tones. All of this results in the ability to correct for errors caused by noise, so that the information may be extracted accurately down to SNRs even as low as -28dB, with decoding errors increasing rapidly below this level.

I have also included parameters for FT8 and JT65A in Table 1 together with estimates of the processing gain etc calculated in the same rough fashion. Note, however, that although my estimates based on repeating the data bits are crude and do not represent what is actually done, they do give a reasonable view of what can be achieved.

## In practice

Given the tremendous processing gains achievable with digital modes, the question naturally arises as to why radio amateurs don't use these exclusively. The reason, of course, is that the digital modes slow down the rate of communicating information to the extent that chatting is just not possible. Nevertheless, in situations where you are forced to live with a poor noise environment, or where you are interested only in establishing contact with as many stations as possible, a digital mode presents an attractive option.

If, like me, you are interested in radio propagation, Joe Taylor's Weak Signal Propagation Reporter (WSPR) represents a powerful tool for checking to see which bands are open to which parts of the world. But what should I expect to find? That, of course, depends on many factors including solar activity, radio frequency and so forth. If I was in outer space, with unobscured straight-line propagation and dipoles at each end, I would expect to be able to receive SSB signals on 20m from a 10W transmitter with good copy at a range of about 6,200km with my noise floor of S5. WSPR, on the other hand, would give me a range of perhaps 160,000km.

Here on the Earth I need to take account of the fact that the Earth is a sphere, generally opaque to radio waves and more or less conducting, with a highly-variable and patchy ionosphere at a height of about 200km (for the F region). To make a precise calculation of the maximum range is mostly too complicated, but we can get a good idea of what might be achievable on average by using one of the ionospheric propagation models. Note that the predictions made by such models cannot be more than indications of what to expect, as they cannot take account of the actual state of the ionosphere at any moment.

**Figure 1** shows a screen capture of G4ILO's excellent VOAProp program, taken as I write this article. (There are several other propagation tools available, based both on the VOACAP model and the newer ITURHF model. The RSGB website **[1]** has details.) G4ILO's program makes predictions based on the VOACAP propagation model for each of the HF amateur bands, in this case 20 metres. The green contours show signal levels, S1 in green, S5 in orange, to be expected when transmitting 100W (+50dBm) from a transmitter connected to a dipole situated at the red dot (my home QTH). You can see that the model predicts that I should be able to receive signals from the Eastern seaboard of the USA, most of Europe, Scandinavia, North Africa, and from China and (almost) from Japan, all at least at the S1 level. **Figure 2** shows what I can actually see.

You can see evidence of the presence of WSPR signals in the waterfall plot on the left of Figure 2, indicated by faint pale blue and white vertical lines. Each vertical line corresponds to one WSPR signal being received. On the right is shown the list of signals that have been decoded. Note especially the column marked dB. This is the SNR of the received signal, eg -29dB for the first decode of signals from LZ1UBO. This means that the signal was decoded at a level of 29dB below my noise level in 2500Hz, S5.

The locations of the stations appearing in the list on the right of Figure 2 have been placed on a map and are shown in **Figure 3**. (This is M0XDK's map, which can be accessed via WRPRnet.org.) There is quite good correspondence between the predictions of Figure 1, and the reality of Figure 3, at least for the Eastern sea-board of the USA, Scandinavia, Europe, and as far east as Moscow. Nothing is being received from North Africa, or any locations further east than Moscow, however. This is probably because the ionospheric conditions are not as good as the model suggested for those paths, but we must also factor in the likelihood that WSPR transmitting stations are on the air – most people are asleep in bed in China, for example!

## A digital chatting mode?

Although the digital modes are much more sensitive than SSB, they suffer from the disadvantage that only a small amount of information can be sent in each block, so chatting is currently confined to the analogue modes. But this need not be the case. Suppose that we used a channel of 1kHz for our QSO, into which we crammed 166 WSPR signals, each 6Hz wide. The total number of characters that we would be able to send in one transmission (lasting 112s) would now be 166 times greater than that in any single WSPR channel, amounting to more than 2000 characters. The exchanges between the operators would then be substantial – a sort of 'texting QSO', albeit in a rather laid-back leisurely fashion. The WSPR protocol is probably not the best suited for this mode; careful design might bring further benefits, especially with regard to synchronisation, the length of each block and so forth. But the ability to 'text' on the air with stations 8,000km away, even if you are in a noisy RF environment, surely has its attractions. If you think this is a good idea, please send me an email, and let me know if you are interested in helping to get it going.

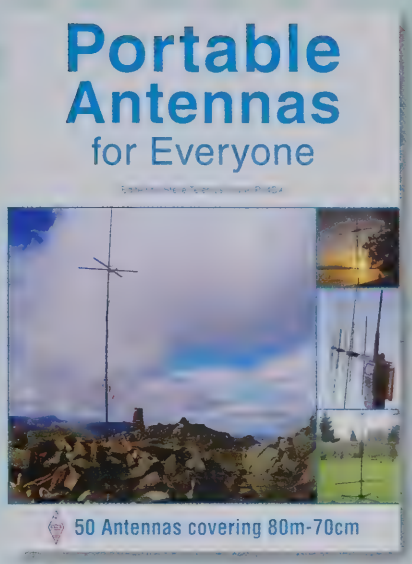
**Websearch**

[1] https://rsgb.org/main/technical/propagation/on-line-propagation-tools/

RSGB SHOP

# Portable antennas

Edited by Steve Telenius-Lowe, PJ4DX




Portable operating has never been as popular as it is today, thanks to the many excellent modern, small and lightweight transceivers that are available. But, indoors or outside, any station is only as good as its antenna, and that is where this book comes in.

Broken into sections covering the main types of antenna. Specific designs from around the world are included, starting with a fibreglass pole and a simple 10m length of wire attached to make a quarter-wave vertical antenna for 7MHz. Continuing into verticals designed specifically for use by the ocean and that provide a super-low angle of radiation of just 6 or 7 degrees above the horizon. How to make a vertical dipole array (VDA) is described and there is advice on kite-supported verticals. There are also designs for HF dipoles, doublets and making your own lightweight HF beams. VHF and UHF antennas are not forgotten: with a dual-band Yagi for satellite working, collapsible 2m and 6m beams, a roll-up J-pole, a 70cm Lindenblad antenna and even a dual-band beam made from tape measures. You will also find reviews of commercially made antennas for portable operations. These include the Spiderbeam, the ultra-lightweight Hexbeam, the folding Hexbeam, the all-band 'SuperStick', an easily transportable magnetic loop and much, much more.

If you are suffering from high domestic noise levels at home, operating portable from the countryside can be a real revelation. Often there is no local noise whatsoever and you find you can copy S1 signals with ease. So now there's no excuse: *Portable Antennas for Everyone* allows everyone to get on the air while experiencing the great outdoors!

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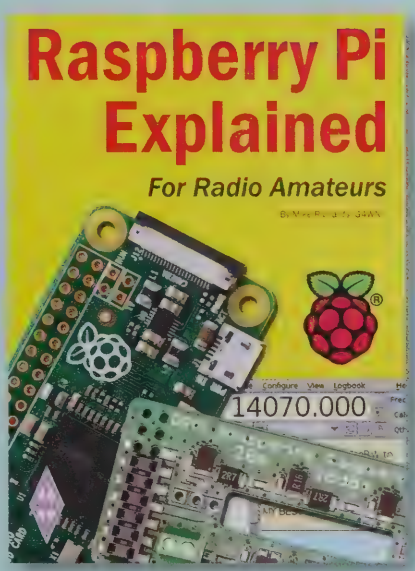
# Raspberry Pi Explained *For Radio Amateurs*

By Mike Richards, G4WNC




The Raspberry Pi series of low-cost single-board computers were developed to promote teaching of basic computer science in schools. However, they have become extremely popular and are selling well outside the original target market including in Amateur Radio. Well known expert Mike Richards, G4WNC sets out in *Raspberry Pi Explained* to provide the basics of the Raspberry Pi, alongside making them work in an amateur radio context.

This book guides you through step-by-step instructions to get the Pi working for you. Once you've learnt the basics, *Raspberry Pi Explained* is packed with comprehensive details of the Pi hardware and Linux operating system, including all those hard-learnt tips and tricks you need to make the most of the Pi. Mike also guides you through the installation of many of the popular radio related software packages. Readers will find detail of using WSPR, Dire Wolf, FLDIGI, WSJT-X on a PI alongside Software Defined Radio (SDR) applications such as GQRX, Linrad, Quisk to name just a few. Those without a working knowledge of the Raspberry Pi are not forgotten and they will still find *Raspberry Pi Explained* a vital reference that is packed with tips, advice, projects, programming and much more.

*Raspberry Pi Explained* is aimed at the beginner through to the experienced. So if you are considering using a Raspberry Pi for Amateur Radio but don't know where to start or perhaps you already have a Raspberry Pi and need help to getting going, then this is the book for you!

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Please send news reports to radcom@rsgb.org.uk. To get future events listed here and put on GB2RS, email details of your meetings as early as possible to radcom@RSGB.org.uk. Include your club name, RSGB Region number, contact name, callsign & phone number, date and details of meeting. **Example:** Fraser Road Radio Club, Region 9, Steve, M1ACB, 01234 832 700, 29 Oct, talk on meerkat farming, Phil, G9ABC. We normally acknowledge all submissions within 3 working days: if you don't hear from us, please phone. We don't normally include 'closed', 'TBA' or 'every Tuesday'-type entries. **The deadline for the August issue is 24 June and for September it's 22 July.** For GB2RS, the deadline is 10am sharp on the Thursday before transmission.

# CLUB EVENTS CALENDAR

At the time of going to press the lockdown situation is changing slowly, so keep club members and local amateurs up to date with your nets, online club nights or any other activities by emailing radcom@rsgb.org.uk. The GB2RS deadline is 10am sharp on the Thursday before transmission and the August *RadCom* deadline is 24 June.

## INTERNATIONAL

**Pafos Radio Club, Cyprus**
**Richard, 5B4AJG, 5b4ajg@gmail.com**
Meets 3rd Thursdays at BREEZE Restaurant (formerly Hole in the Wall), Coral Bay, 6 for 6.30pm. Visitors welcome.

## REGION 1: SCOTLAND SOUTH & WESTERN ISLES

RR: Anthony Miles, MM0TMZ, RR1@rsgb.org.uk

**Cockenzie & Port Seton ARC**
**Bob, GM4UYZ, 01875 811 723**
3 Meeting pending lockdown outcome

**Edinburgh & District ARC**
**Norman, GM1CNH, 0774 094 6192**
6, 13, 20, 27 Club net, start 433.525MHz FM, 8pm

**Kilmarnock & Loudoun ARC**
**Len, GM0ONX, klarcinfo@gmail.com**
4, 11, 18, 25 Internet 'net' (members who do not already have the login details should send an email to klarcinfo@gmail.com)
5, 12, 19, 26 SSB net, 2pm, 3.720MHz± then QSY to 3.540MHz± for CW net
7, 14, 21, 28 FM net, 145.475MHz, 7.30pm

**Lomond Radio Club**
**Barrie, GM4HEL, gm0kzx@googlemail.com**
2, 9, 16, 23, 30 Club net, 144.9625MHz and Echolink MB7IBH-L, 7pm-8pm

**Mid Lanarkshire ARS**
**https://mlars.co.uk/**
1, 8, 15, 22, 29 Net, DMR Scotland chat room TG23550, from 8pm
3, 10, 17, 24, 31 Net, Zello on the club's channel, from 7.30pm then on 2m
5, 12, 19, 26 Net, 28.475MHz, from 10pm

**West of Scotland (Glasgow) ARS**
**Jack, GM4COX, wosars.club**
3, 10, 17, 24, 31 Club night – summer programme if circumstances allow
8, 15, 22, 29 Solder group meeting if circumstances allow

**Wigtownshire ARC**
**Clive, GM4FZH, info@GM4RIV.org**
Listen on GB3DG, especially around 12 noon every day when D&G RAYNET have an open net for all
5, 12, 19, 26 UFN: meet on GB3DG at 7.30pm. Also trialling Zoom and Zello, see website for details/changes.

**Next deadlines**
24 June (August issue)
22 July (September issue)
26 August (October issue)

## REGION 2: SCOTLAND NORTH & NORTHERN ISLES

RR: Denny Morrison, GM1BAN, RR2@rsgb.org.uk

**Dundee ARC**
**Martin, 2M0KAU, 0776 370 8933**
1, 5, 8, 12, 15, 19, 22, 26, 29 Net, 7.30pm, GB3AG 145.725MHz
4, 5 VHF NFD, depending on circumstances
7 VHF 2m contest
25, 26 IOTA Contest from home stations

**Glenrothes & District RC**
**Tam, 0775 352 6498**
7, 14, 21, 28 Morse training session, 145.425MHz, starting 7.20pm for checks; Morse from 7.30 to 8.30pm
8 Fife radio net

## REGION 3: NORTH WEST

RR: Kath Wilson, M1CNY, RR3@rsgb.org.uk

**Bolton Wireless Club**
**boltonwireless@gmail.com**
13, 27 See website for latest information

**Chester & District RS**
**Bruce, M0CVP, 01244 343 825**
Try the SSB Calling Frequency (144.300MHz) or 3.605MHz at any time of day or evening as these frequencies are, currently, regularly monitored by many club members
3, 10, 17, 24, 31 Net, 9.30pm, 144.330MHz (QSY after netting)
5, 12, 19, 26 Net, 12 noon, 145.500MHz then QSY as advised by Net Control
7, 14, 21, 28 Net, 3pm, 3.605MHz (± as advised by Net Control)

**Furness ARS**
**Chris, M0KPW, info@fars.org.uk**
1, 8, 5, 22, 29 Virtual meetings using Zoom with presentations, talks, demonstrations and quizzes

**Isle of Man ARS**
**Andy Morgan, GD1MIP, info@iomars.im**
5, 12, 19, 26 Net, 3.715MHz± QRM, 9.30am; net, GB3IM, 11.30am following GB2RS News
7, 14, 21, 28 Net, 7.30pm, GB3IM network. Please don't start the net until the controller has initiated it

**Macclesfield & District RS**
**Greg, M0TXX, Info@gx4mws.uk**
6, 13, 20, 27 Club net, 2m FM, from 7.30pm. Listen to 145.325MHz

**South Manchester R&CC**
**chairman@smrcc.org.uk**
Daily course and Morse tuition via Skype and daily Morse practice via email attachments
1, 8, 15, 22, 29 FM net, 8pm, 51.530MHz
2, 9, 16, 23, 30 Main meeting and Morse FM net 7.30pm, near 145.475MHz
5, 12, 19, 26 SSB net, 10.30am, 3,637kHz
7, 14, 21, 28 Technical and Morse FM net, 7.30pm, near 145.475MHz

**Southport & District ARC**
**Brian, M0SSN, 0777 169 5525**
5, 12, 19, 26 Net, from 7.30pm, starting on 145.500MHz then moving to a to free channel
6, 20 Virtual meetings using Zoom

**Stockport Radio Society**
**Heather, M6HNS, 0750 690 4422**
6 Net, 433.525MHz, from 7.30pm
7 Morse class, from 7pm
14 Net, 51.550MHz FM, from 7.30pm
16, 29 Net, n 145.375MHz, from 7.30pm
20 C4FM Fusion net, 144.725MHz, from 7.30pm
25, 26 IOTA Contest from home locations

**Thornton Cleveleys ARS**
**John, G4FRK, 01253 862 810**
2, 9, 16, 23, 30 FM net, 145.425MHz, 8pm
5, 12, 19, 26 Top Band net, 1.969MHz, 11am
6, 13, 20, 27 FM net, 145.425MHz, 7.30pm

**Warrington Amateur Radio Cub**
**Jeff, G1DYN, secretary@warc.org.uk**
Daily open net from 10am around 145.350MHz
5, 12, 19, 26 Open net, from 2pm, around 145.425MHz
7, 14, 21, 28 Virtual club net via Zoom, 8pm-9pm

**Wirral & District ARC**
**Simon, G6XHF, 0151 601 3269**
1, 8, 15, 22, 29 Net, 145.325MHz, from 8pm, see club website
5, 12, 19, 26 Morse sessions, 11am, 144.350MHz

## REGION 4: NORTH EAST

RR: Ian Douglas, G7MFN, RR4@rsgb.org.uk

**Angel of the North ARC**
**Nancy, G7UUR, 0799 076 0920**
6, 13, 20, 27 Net, GB3HA, 8pm, all welcome

**Denby Dale ARS**
**Gerald, G3SDY, 01484 602 905**
Regular morning nets at 9.30am on 145.575MHz

**Hull & District ARS**
**Tony, G0WJK, 0794 464 8924**
1, 8, 15, 22, 29 Zoom ragchewers meeting, 8pm
2, 9, 16, 23, 30 Net, 145.325MHz±, from 8.30pm
3, 10, 24, 31 Zoom technical meeting, 8pm
6, 13, 20, 27 Net, 145.350MHz, 7pm
17 Zoom meeting, 8pm: NanoVNA

**Ripon & District ARS**
**David, G3UNA, 01423 860 778**
2, 9, 16, 23, 30 Club net, GB3HG, 8pm
6, 13, 20, 27 Club net, GB3HG, 7.30pm

**Spen Valley ARS**
**Russell, G0FOI, 01274 875 038**
2, 9, 16, 23, 30 Meetings on the air, 28.750MHz, 8pm

**Wakefield & District RS**
**Charles, M0OXO, 0790 050 0775**
2, 9, 16, 23, 30 Open net, from 7pm, 144.600MHz FM

**York Radio club**
**www.yorkradioclub.uk**
**contactus@yorkradioclub.uk**
1, 8, 15, 22, 29 Club net, 145.450MHz, from 8pm

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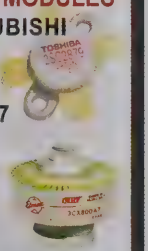

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## REGION 5: WEST MIDLANDS
RR: Martyn Vincent, G3UKV, RR5@rsgb.org.uk

Burton ARC
**Rob, G6EIH, 0781 214 6333**
1, 8, 15, 22, 29 Open net, 7.30pm, 145.575MHz FM
2, 9, 16, 23, 20 Open net, 8pm, 145.575MHz FM
5, 12, 19, 26 Open FM net, 10am, 145.575MHz FM
6, 13, 20, 27 Slow CW exercise, 7pm, 14.055MHz

Central Radio Amateur Circle
Text 0794 802 7994
1 Skype meeting, 7pm

Coventry ARS
**John, G8SEQ, 0795 877 7363**
1, 8, 15, 22, 29 DMR net, Talk Group 2345974, from 8.30pm
2, 9, 16, 23, 30 Net, 50.175MHz SSB, from 7pm
6, 13, 20, 27 Net, 145.375MHz FM, from 8pm, net on 7.175MHz SSB, 8pm
31 Net, 145.375, 8pm

Gloucester AR&ES
**Anne, 2E1GKY, 01242 699 595 daytime, www.g4aym.org.uk**
1, 8, 15, 22, 29 Club net, from 7.30pm, 145.475MHz FM
2, 9, 16, 23, 30 Club net, from 7.30pm, 145.475MHz, then moving to 80m SSB
3, 10, 17, 24 Club net, from 7.30pm, 432.220MHz SSB

Malvern Hills RAC
**Dave, G4IDF, 01905 351 568**
1, 8, 15, 22, 29 Net, 145.350MHz FM, from 8pm

Midland ARS
**Norman, G8BHE, 0780 807 8003**
1, 3, 6, 8, 10, 13, 15, 17, 20, 22, 24, 27, 29, 31 Club net, from 7.30pm, 145.425MHz Visitors welcome

Mid-Warwickshire ARS
**Don, G4CYG, 01926 424465**
1, 8, 15, 22, 29 Net, 8pm, 145.275MHz

Rugby ATS
**Steve, G8LYB, 01788 578 940**
Monday to Friday, daily net on 144.275MHz SSB from 8.30am

Salop ARS
**Eamonn, M0MEB, salopamateurradio@gmail.com**
1, 8, 15, 22, 29 Club net, from 8pm, GB3LH
2, 9, 16, 23, 30 Net, 8pm, 144.230MHz SSB (144.775MHz FM will also be monitored)
6, 13, 20, 27 Net, 2pm, 144.230MHz SSB

Solihull ARS
**Stu, G4KUR, solihullradioclub@gmail.com**
2, 9, 16, 23, 30 Club net, 145.450MHz, from 8pm

South Birmingham RS
**Martin, M0JZT, m0jzt@zoon.com**
7, 14, 21, 28 Coffee morning online 11am to 1pm using Zoom

Stourbridge & District ARS
**John, M1EJG, 01562 700 513**
6, 13, 20, 27 Net, 145.325MHz, from 8pm

Sutton Coldfield ARS
**Robert Bird, rob2e0zap@gmail.com**
6, 20 Open net, starting on 145.250MHz, 7.30pm
14 Open net, 70.475MHz, from 7.30pm
28 DMR open net on frequency slot/local 2 gb7fw Birmingham from 7.30pm, all welcome

Wolverhampton ARS
**Vaughan, M0VRR, chairman@wolverhaptonars.co.uk**
1, 8, 15, 22, 29 Net, from 8pm, 145.325MHz or other frequency via the calling channel

Wythall Radio Club
**Chris, G3YHF, 0795 839 5904**
5, 12, 19, 26 Club net, 145.225MHz or GB3WL, 8pm
7, 14, 21, 28 On air meeting, 145.225MHz and/or GB3WL, 8.30pm

## REGION 6: NORTH WALES
RR: Liz Cabban, GW0ETU, RR6@rsgb.org.uk

Dragon ARC
**Simon, MW0NWM, darc.secretary@gmx.co.uk**
6, 13, 20, 27 Club web chat via Jit.si, 7pm;. Club net, 145.550MHz, 8pm. Club net, GB3AN, 9pm

## REGION 7: SOUTH WALES
RR: Glyn Jones, GW0ANA, RR7@rsgb.org.uk

Aberystwyth & District ARS
**Ray, GW7AGG, 01970 611 853**
30 Club net, starting on 145.500, then 145.550MHz

Barry ARS
**Glyn, GW0ANA, glyndxis@talktalk.net**
7 Club net, 8pm, 3.756MHz SSB

Blackwood & District ARS
**Rob, MW0CVT, mw0cvt@sky.com**
3, 10, 17, 24, 31 Net, 7pm to 9pm 144.575MHz FM, available via www.mw0mwz.co.uk/liveshack.php, all welcome
5, 12, 19, 26 Net, 12 noon to 1pm, 3.703MHz± QRM, available via www.mw0mwz.co.uk/liveshack.php, all welcome

Carmarthen ARS
**Andy, GW0JLX, 0776 828 2880**
1, 8, 15, 22, 29 Using local Fusion repeater GB3CM, net either FM or Fusion, depending on user selection, 7.30pm. GB3CM uses a +7.6MHz shift from 430.8625MHz and has an access tone of 94.8Hz CTCSS
5, 12, 19, 26 Net, from 2.30pm, 80m SSB

## REGION 8: NORTHERN IRELAND
RR: Philip Hosey, MI0MSO, RR8@rsgb.org.uk

West Tyrone ARC
**Philip, MI0MSO, 0784 902 5760**
West Tyrone Amateur Radio Club says meetings will resume when it is safe.

## REGION 9: LONDON & THAMES VALLEY
RR: Tom O'Reilly, G0NSY, RR9@rsgb.org.uk

Bracknell ARC
**David, M0XDF, M0XDF@alphadene.co.uk**
1, 15, 22, 29 Net, 8pm, 145.375MHz FM, moving to Brandmeister DMR Talkgroup 23529 from around 8.40pm

**Next deadlines**
24 June (August issue)
22 July (September issue)

Burnham Beeches RC
**Greg, G4EBY, ebytronics@gmail.com**
5, 12, 19, 26 Club net, from 10.30am, starting on 145.500MHz then moving to 145.275MHz and Zoom
6 Morse training, Zoom, 7.30pm. Fox Hunt, 8pm, if possible
13, 27 Morse training, Zoom, 7.30pm
20 Morse training, Zoom, 7.30pm. Club meeting, Zoom, 8pm

Edgware & District RS
**www.g3asr.co.uk**
Net, Monday – Friday, 3pm, 145.500MHz FM then QSY. All are welcome
2, 9, 16, 23, 30 Net, 9pm, 50.140MHz USB
6, 13, 20, 27 Net, 9pm, 145.500MHz FM and QSY. Net, 9.30pm, 1985kHz± QRM LSB

Milton Keynes ARS
**Stuart Crann, stuart@m0mmz.com**
Virtual coffee morning, details on website and Facebook page. All welcome
5, 12, 19, 26 Net, 8pm, GB3MK. Net, 8pm, 28.400MHz±

Radio Society of Harrow
**Linda, G7RJL, lcasey100@outlook.com**
2, 9, 16, 23, 30 Club net, from 8.15pm, 145.350MHz NFM
5, 12, 19, 26 Club net, from 2pm, 145.350MHz NFM

Reading & District ARC
**Tom, M0LTE, tom@m0lte.uk**
16 GB3RD Net, 8.10pm
23 Remote meeting / net, joining details on radarc.org/events

Shefford & District ARS
**David, G8UOD, 01234 742 757**
2, 9, 16, 23, 30 Club net, from 8pm, starting on 145.500MHz then moving to a free channel
6, 13, 20, 27 Net, 7pm, 1985kHz SSB

Whitton Amateur Radio Group
**Ian, G0OFN, 0795 620 3495**
If restrictions lift, meetings on 3, 10, 17, 24, 31 July
1, 3, 8, 10, 15, 17, 22, 24, 29, 31 Jitsi video conference, 8pm, accompanied by net, 145.375MHz FM and/or 28.395MHz SSB

## REGION 10: SOUTH & SOUTH EAST
RR: Keith Bird, G4JED, RR10@rsgb.org.uk

Crystal Palace R&EC
**Bob, G3OOU, 01737 552 170**
1, 8, 15, 22, 29 Club net, from 8pm, around 145.525MHz

Farnborough & District RS
**Mel, M0JMR, publicity@farnboroughradio.org.uk**
4, 5 VHF NFD. See club website for details

Fort Purbrook ARC
**Rod, G4SPS, g4sps@fparc.org.uk**
3, 10, 17,24, 31 Open net, 7pm, 433.450MHz QSY GB3IW, 7.30pm, for a joint open net with IOW ARS
6, 13, 20, 27 Open net, from 8pm, 145.275MHz

Surrey Radio Contact club
**John, G3MCX, 020 8688 3322**
3, 10, 17, 24, 31 D-Star net, 144.6125MHz, from 7.30pm. Net, 145.350MHz FM, from 8pm
5, 12, 19, 26 Net, 1905kHz LSB, from 9.30am
7, 14, 21, 28 Net, 51.550MHz FM, from 8pm

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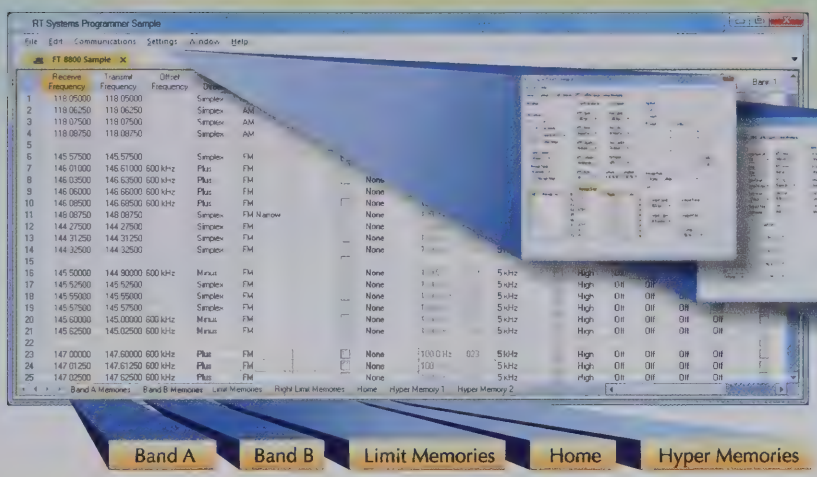


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for those special functions of the radio

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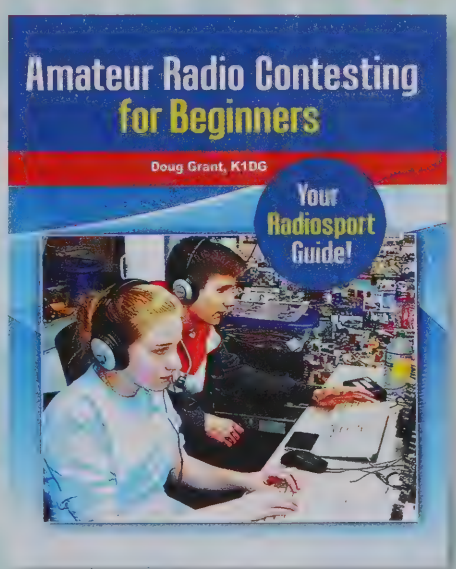
# ARRL Amateur Radio Contesting for Beginners

RSGB SHOP

By Doug Grant, K1DG

Contesting can be one of the most exciting aspects of amateur radio and for many "radiosport" is the cornerstone of what they do with amateur radio. Amateur radio contesting is a competition to see who can contact the most stations in an allotted amount of time. *Amateur Radio Contesting for Beginners* sets out to explain how to get into contesting, the equipment, the strategy and much more.




Beginning with a brief history and overview of contesting well known contester Doug Grant, K1DG spells out for the beginner the basics of contesting, the equipment needed, operating techniques and the strategies to employ. *Amateur Radio Contesting for Beginners* goes on to explain what happens after the contest if over, VHF/UHF and Digital Contesting and what is needed to move to the next level. Giving you everything you need to get started Doug explains that regardless of the size of your station, you can compete in contests too.

If you have considered contesting before but haven't known where to start *Amateur Radio Contesting for Beginners* could be for you. If you are looking for a new challenge maybe this book could also be your roadmap to competitive excitement and radiosport success!

**Size: 184x227mm, 240 pages, ISBN: 9781 6259 5124 3**
**Non Members' Price29.99, RSGB Members' Price £25.49**

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E&OE
*(All prices displayed plus p&p)*

9, 16, 23, 30 Net, 28.078MHz JS8 digital, from 10am; Net, 70.300MHz FM from 8pm

West Kent ARS
Keith, G4JED, info@wkars.org.uk
5, 12, 19, 26 Net, 8pm, 145.375MHz ±QRM. Non-members welcome

## REGION 11: SOUTH WEST & CHANNEL ISLES
RR: Dean Brice, G0UIL, RR11@rsgb.org.uk

Exeter ARS
Ivor, G6ATJ, 0792 762 8685
7 Club net, GB3EX, from 7.45pm
14, 21, 28 Club net, GB3EW, from 7.45pm

Isle of Avalon ARC
Matt, M3MMZ, 07368 487996
On air, 145.475FM, every night from 9pm keeping the area in contact with each other

South Bristol ARC
Andy, G7KNA, 0783 869 5471
2, 9, 16, 23, 30 Club net, GB3WR

Torbay ARS
Kerry Knight, M0KRE, kerry@m0kre.net, 0772 599 9973
1, 8, 15, 22, 29 Net, 14.270MHz, from 9.30am; Net, 3.663MHz, from 10.30am
3, 10, 17, 24, 31 Net, 3.663MHz, from 9.15pm
4, 11, 18, 25 Net, 3.663MHz, from 10am
5, 12, 19, 26 Net, 14.270MHz, from 9.30am; Net, 145.575MHz, from 12 noon
6, 13, 20, 27 Net, 3.663MHz, from 10.30am; Net, 1.982MHz, from 8pm; Net, 50.155MHz, from 8.30pm

**Next deadlines**
24 June (August issue)
22 July (September issue)
26 August (October issue)
23 September (November issue)
21 October (December issue)

## REGION 12: EAST & EAST ANGLIA
RR: David De La Haye, M0MBD, RR12@rsgb.org.uk

Braintree & District ARS
Edwin, G0LPO, on 01376 324 031.
7, 21 Club net, 8pm, 145.375MHz
14, 28 Meeting on the air, 8pm, 145.375MHz

Camb-Hams
www.camb-hams.com
7, 14, 21, 28 Net, on GB3PI, from 8pm

Cambridge & District ARC
Bryan, M0IPO, publicity@cdarc.org.uk
10, 24 Zoom online meetings or on-air via GB3PI at 8pm

Chelmsford ARS
Jon, M0KGX, Jon@M0KGX.com
Daily nets, 8.10am, 145.4MHz GB3CG; 8.40am, 28.450MHz
5, 12, 19, 26 Net, 50.220MHz
7, 14, 21, 28 Slow CW, 3540-3545kHz, 8-9pm
14, 21, 28 Club net, from 8pm, GB3DA
16 CARA On The Air, 3700kHz, 28.450MHz, 70.475MHz; 145.4MHz, GB3CG & GB7RC

Colchester Radio Amateurs
Mark, M0LTG, 07703 745369
1, 8, 15, 22, 29 Open net, FM 145.350MHz, from 7pm
2, 9, 16, 23, 30 Open net, 3.685MHz, from 7pm
5 Open CW net, 144.163MHz SSB, from 9.30pm; Open net, 50.225MHz, from 7pm
6, 13, 20, 27 Open CW net, 144.163MHz SSB, from 9.30pm
7, 14, 21, 28 Open net, FM 433.425MHz, from 7pm; Open net, 1.920MHz, from 7pm
19 Open CW net, 144.163MHz SSB, from 9.30pm
26 Open net, 28.225MHz USB, from 7pm; Open CW net, 144.163MHz SSB, from 9.30pm

Felixstowe & District ARS
Paul, G4YQC, pjw@btinternet.com
1, 8, 15, 22, 29 DMR net, 7pm TG840, everyone welcome
5, 12, 19, 26 Club net, 10am, 145.400MHz, everyone welcome
6, 13, 20, 27 Net, 7.45pm GB3IH, everyone welcome

King's Lynn ARC
web.klarc@gmail.com
2, 9, 16, 23, 30 Open net, 7pm - 8pm, GB3KY FM, all welcome
5, 12, 19, 26 Open net, 7pm - 8pm, GB3KY FM, all welcome
7, 14, 21, 28 Open net, 7pm - 8pm, 144.290MHz USB, all welcome

## REGION 13: EAST MIDLANDS
RR: Mark Burrows, 2E0SBM, RR13@rsgb.org.uk

Kettering & District ARS
Ed, M0TZX, M0TZX@yahoo.com
2, 9, 16, 23, 30 Net, from 7pm, 145.300MHz FM

Loughborough & District ARC
Chris, G1ETZ, 01509 504 319, g1etz@aol.com
5, 7, 12, 14, 19, 21, 26, 28 Club net, from 7.30pm, around 145.425MHz

Nunsfield House ARG
Paul, G1SGZ, pr@nharg.org.uk
2, 3, 9, 10, 16, 17, 23, 24, 30, 31 Net 145.325MHz, 8pm
6, 13, 20, 27 Net on 433.450MHz, 8pm with Stefan, M0OSL

RAF Waddington ARC
Bob, G3VCA, 0797 116 6250
3, 10, 17, 24, 31 Net, 7.30pm, 145.300MHz± FM.
6, 13, 20, 27 Club net, 8pm, 145.325MHz FM
Don't to forget monitor S20, U280, LM & LS

South Kesteven ARS
Steve, 2E0WCG, 01780 764 419
1, 8, 15, 22, 29 Net, GB3GR, 8pm, all welcome

Welland Valley ARS
Peter, G4XEX, QTHR, 01858 432 105
6 Club net, 7.30pm, 145.275MHz FM

Stockport Radio Society is celebrating its 100th anniversary this year, although many plans have been cancelled due to the Covid-19 pandemic.
The timeline (right) is the first part a graphic the club was going to use at the NARSA rally, which was cancelled due to the lockdown.
The second part of the timeline is on page 91.

With all its members' equipment confiscated, and no operating activity for somewhat longer than the duration of the war, Stockport Wireless Society had suffered an enforced hibernation.
Many of its members had been away on active service and where previously it had been their pleasure to keep in touch simply by picking up a microphone, they had been reduced to using the good offices of those radio journals which had been able to keep on printing, such as the old 'I' and R Bulletin', forerunner of todays RadCom.
1920 >>> 1925 >>> 1930 >>> 1935 >>> 1940 >>> 1945
1945 >>> 1950 >>> 1955 >>> 1960 >>> 1965 >>> 1970

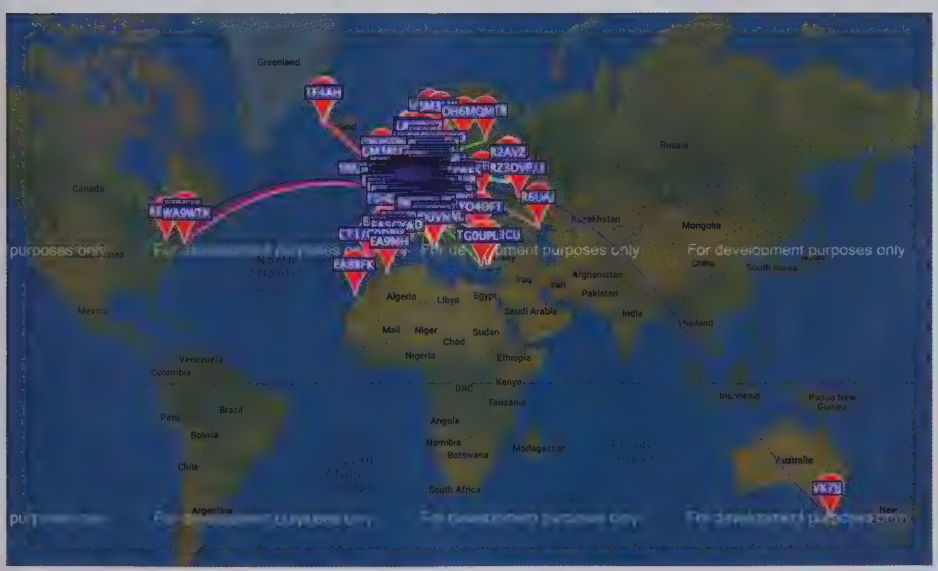
The Covid-19 pandemic has affected amateur radio clubs around the world with many now holding virtual meetings and more nets to keep members in touch with one another as amateurs, like others, stay in their homes. The activities here all took place before social distancing and other restrictions were in place. If your club is doing something unusual to keep meetings going, has found useful ways to look after not only your own members but others in the community or is just setting up extra nets, let us know. Check out the Club Calendar section for details of all the nets and virtual meetings we have heard about. Amateur radio is a wonderful hobby for keeping us from getting isolated, whether you just have access to your local repeater or can talk to stations on the other side of the world.
Stay safe – *RadCom* Editorial Team

## REGION 2: SCOTLAND NORTH & NORTHERN ISLES

Normally Martin, 2MOKAU operates portable as he suffers from high noise levels at his QTH. **Dundee ARC** has been running a twice weekly net through the GB3AG repeater, which Martin can access without too much noise.

## REGION 3: NORTH WEST

Warrington ARC now meet daily, including weekends, for up to an hour from 10am on 145.350MHz±. In addition, instead of the usual weekly club meeting, the club now meets every Tuesday evening for a presentation and every Sunday afternoon for technical help via Zoom (right). This will continue until the end of this lockdown




## REGION 4: NORTH EAST

Ripon & District ARS member David, M0VGA has been active on 40m using WSPR (left). His most non-DX contact was Lee, M0LMH who lives on the same road as his mother! He doesn't get many local spots on 40m WSPR, mostly Western Europe with a few East Coast USA and others like Australia (where his sister lives) thrown in the mix. He has wondered whether the spots he get from oceans are people operating from boats or maybe people just programming their locators incorrectly! Some spots from the Arctic (or Antarctic) seem to check out as genuine contacts when looking up their activities on qrz.com. He uses a 200mW SOTABEAMS WSPRLite and the AirSpy Discovery HF+ SDR using the Aerial-51 OCFD.

## REGION 5: WEST MIDLANDS

Central Radio Amateur Circle has been very busy over the past couple of months. They now run a net every Saturday from 12.30pm on 145.375MHz and a Zello channel on Tuesday nights on the club channel. They have also been running online meetings using Skype. The club has a core group of members who live within a few miles of each other and over the past couple of months they have been keeping in contact with each other, making sure they stay safe.

## REGION 6: NORTH WALES

During May, members of Dragon ARC and North Wales RS ran the special event callsign GB0GIG from their own homes, to recognise the hard work and dedication of the National Health Service (GIG in Welsh: Gwasanaeth Iechyd Gwladol). The call also helped to promote the RSGB Get On The Air 2 Care campaign. With just three days of the event left to run they had made over 3,000 QSOs on all bands from 80 through to 10m as well as 2m and 70cm, using SSB, CW and FT8, digital ATV and also SSB via QO-100. They have had dozens of long conversations with amateurs in the UK and beyond who have appreciated having someone to talk to during lockdown, plus many amateurs have worked them on several occasions to chase the club's award certificates. They would like to thank the amateur community for enthusiastically joining in their fun by calling them!

## REGION 8: NORTHERN IRELAND

Mid Ulster ARC has been making use of socially distant measures but not unsociable or uncharitable. Davy, MI0IRZ, the treasurer, came up with the idea to raise some funds for Craigavon Area Hospital, to buy iPads for patients to keep in communication with their families. They knew where they could get an old hand-cranked air raid siren (right), met at a local car park, had a cavalcade just before 8pm and a donation point of buckets on tables where people could throw in some spare change. The air raid siren is loud! At the time of writing, through cash donations and a Just Giving page, £1850 has been raised enabling them to buy 5 iPads and covers. Amateurs again, making a difference and making themselves heard!

## REGION 10: SOUTH & SOUTH EAST

All Surrey RCC meetings are suspended until further notice. The club is experimenting at committee level with virtual meetings on Zoom and Webex. Details will be sent to members in the monthly newsletters and on website. Please check the website srcc.uk for possible online activity.

Due to the crisis, Farnborough & District RS meetings have been cancelled until further notice. The committee decided to start up weekly Zoom meetings online to provide the missing face to face social contact for club members (below). The meetings are organised on lines similar to their radio nets on Monday and Friday where each member is given the chance to update the rest on what has been happening since last meeting. This maintains a degree of order, minimising interruptions and reduces background noise. They have had online presentations on fixing antique test gear, GHz technology, virtual tours of members shacks and interesting background history of some members plus much more. Other presentations are in the pipeline. The meetings have proved to be extremely popular and provide visual contact with members who find themselves in far distant places. www.farnboroughradio.org.uk/contact.html.

## REGION 11: SOUTH WEST & CHANNEL ISLES

The Isle of Avalon ARC is thanking the NHS for everything they do and are on air every night on 145.475MHz FM from 9pm keeping the area in contact with each other.

11-year-old Anne Marie, 2E0RUX, together with her dad, Bill, MONXF, have arranged radio nets for local amateurs from the beginning of the lockdown. It gives the local amateurs something to look forward to each week and keeps their spirits up through this horrible time. Anne Marie runs a 4m net on Tuesday evenings and a 2m FM net on a Friday evening both starting at 8pm. Bill runs a 2m SSB net on Thursday evenings also starting at 8pm. All the nets are well attended.

Anne Marie has had quite a lot of media attention having been interviewed on BBC Radio Cornwall, in a RSGB Facebook article and in local newspaper coverage. The club is proud of her.

## REGION 12: EAST & EAST ANGLIA

On 15 March, **Colchester Radio Amateurs** committee had a discussion on how to move forward with the club meetings, and it was decided that they should be postponed until further notice to protect members. Jonathan, G0DVJ, Liz, G0MDL and Bruce, G4EUW started a lockdown Morse course, Jonathan suggested using the LCWO.net site so students can do homework along with having a chat group to ask questions related to Morse. This has been used well by members and a couple of local non club members. CRA has had 14 students take part and all are doing very well and picking up CW very fast. The lockdown Morse nets have been increased on 2m FM to 5 days a week Tuesday to Saturday and twice a week on SSB Sunday and Monday.

The other idea Jonathan had was to have a Virtual CRA Skype Meeting. On 23 April they had the first virtual meeting with 30 amateurs along with at least 4 partners joining too. Herbie, G6XOU, the CRA QSL manager and net controller, added another 80m net to the Thursday meeting night and also 2m FM nets on a Monday afternoon and a Friday morning. This means that the CRA now has 6 phone nets Monday to Friday every week. A Friday DX net on 20m was introduced which is run in the afternoon by CRA member Kevin M0KEB. We run a local talkback on 2M for the locals, the frequency can be found on the Cluster for the HF frequency that's being used.

Garry, M0MGP and Mark, M0LTG started a Groups.io page for CRA Members to announce reminders and new ideas as well as members asking any amateur radio question or general chat. This has been a great help to members already providing many answers to their problems in double quick time. www.g3co.org.uk

Extra nets as clubs go on the air due to the Covid-19 lockdown are proving popular across Essex and North Kent, supported by GB3DA and GB3ER the centrally located repeaters maintained by Essex Repeater Group (ERG). Late last year the group upgraded the GB3DA repeater to a new Yaesu DR2-XE Fusion box, which has been providing excellent audio and sensitivity. GB3ER on 70cm, provides wide area coverage and has always been popular for local clubs and mobile usage. This has proven particularly valuable during the lockdown as it is now supporting several clubs across Essex and North Kent who have raised activity and extra nets.

Clubs and activities supported include:

- Chelmsford ARS use GB3DA and GB3ER for nets on the 2nd and 3rd Tuesdays respectively at 8pm – and have added XTRAnets on GB3ER instead of their club meetings
- Thames ARG use GB3DA for nets every Friday evening
- The BRATS use GB3DA with new nets on most other Tuesday evenings
- Basildon use GB3DA on Wednesdays at 8pm
- EssexHam use GB3DA for its Monday night net
- Essex YL net occurs on the first Saturday evening of the month on GB3DA
- Laindon Radio Club are often on GB3DA on Saturdays

## REGION 13: EAST MIDLANDS

**Leicester Radio Society** have had three members pass the online remote invigilation exams and have two more in the pipeline. 145.325MHz is monitored all week for club members or any other amateurs to have a chat.

Despite lockdown, **Welland Valley ARS** has managed to keep things ticking over, if anything, the club has become more active than it was before! Three club members have taken advantage of the relaxation on the issuing of NoVs to establish special event stations from their home QTHs. Peter, G4XEX has run GB4SAH (Stay at Home) in April and GB5SA in May. While Andy, G4ISN, put GB8SAH and GB2SHS (Stay Home Safe) in April and May. The stations were put up in eternal gratitude to all the essential workers who have risked their health to kept the country running during the Covid-19 outbreak and to all the NHS workers who have looked after the sick and dying. Andy, G0SFJ ran the station GB4VVV for the VE day celebrations – VVV being the old BBC time signal. The daily Covid-19 net is still going strong too. Unable to have regular meetings the club has become a 'Virtual ARS' with meetings online using the LOOK app.

James, M1TES, chairs a Monday and Thursday 'Stay Safe Stay Alert' net at 7.30pm via GB3YL – a repeater managed by **Lowestoft and Great Yarmouth Repeater Group**. He has been overwhelmed by the support received, with around 20 stations calling in each evening.

The second part of the timeline celebrating 100 years of Stockport Radio Society.

1970 >>> 1975 >>> 1980 >>> 1985 >>> 1990 >>> 1995 >>>
1970 SRS members gathered at the Blossoms Hotel to celebrate the 50th anniversary of the Society the second oldest of its kind in Great Britain.
1974 Belle Vue Convention Northern Radio Societies Association (NRSA). A most successful time for SRS. Winning two major prizes. The "Best Stand Trophy" and the "NRSA" Quiz Shield".
1977 On the 5th June John Heywood GBBHQ handed over the reading of the RSGB news bulletin to Peter Torry G3SMT. John was responsible for putting GB2RS on the map in the North West.
1980 SRS Celebrates its Diamond Jubilee
1981 SRS Won the Edgware Trophy in the AFS Contest for the third time since 1978.
1982 The last NRSA Convention was held at Belle Vue in March 82. SRS member Des Alexandro G4HK was one of the original organisers of the convention since 1966.
1984 Manchester Evening News reports that the Society has 150 members and is the largest group of Radio Amateurs outside of London.
1983 NRSA changes name to NARSA moving to Southport. By 1985 it returns to Bell Vue and 4000 people attended. SRS member Bill Hayes G4RLD was Asst. Exhibition. Manager.
1986 Bill Banks G3ARX President dies after 65 years membership of the Society since 1928.
1988 The 6m band is made available to amateurs 50.0-50.5Mhz.
1988 NARSA moves to Blackpool
1990 Barry Simpson G3PEK emigrates now VK2BJ and an overseas member.
1991 With over 60 yrs membership Harry Armfield, G3LX is honoured as the Society's President
1993 Ray HSB/ G3NOM on behalf of President of the Thai Amateur Radio Society presents Harry G3LX with a Pendant.
1995 The Society gets a new logo to mark the 75yrs anniversary. Chairman Laurie, G4ZDO seen showing the members.
1995 >>> 2000 >>> 2005 >>> 2010 >>> 2015 >>> 2020
1995 The Society wins Best Stand at NARSA
1997 Stockport wins Houston Fergus Trophy winning Low Power FD
1998 Nigel,G0RXA SRS Chairman supports special event GB50MKI to commemorate Manchester University Mark One Computer
2001 International morse requirement was reduced from 12wpm to 5wpm
2002 Jim G3KAF and Bernard G3SHF National Field Day.
2002 Foundation licence introduced limited to 10W on HF and VHF/UHF bands with callsigns in the M3 series.
2003 Morse code pass certificate no longer required for licenced Amateurs to access the HF bands.
2005 The Society's Contest Group is formed and use the short callsign G5O
2006 The new "lifetime" Amateur Radio licence was introduced
2008 The club put on a special station GB100STH to commemorate the 100th anniversary of Stockport Town Hall.
2010 The Society again affiliates to NARSA and exhibits at the Blackpool Rally
2013 Nigel G0RXA hands over to Tony M0SAV after 18 yrs as Chairman
2014 Alan G0ROW elected President after Harry G3LX is SK
2014 SRS Contest Group call GM5O on Orkney come runner up in RSGB IOTA. contest
2016 SRS win NFD for the 4th time in 5yrs.
2017 Alan, M6GOY passes the Foundation Exam at the young age of 89
2017 SRS Special Events Group formed to exhibit at outdoor events.
2018 SRS is voted 3rd place in the National Club of the Year (Large Clubs)
2020 Stockport Radio Society Celebrate 100years of Amateur Radio

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**ROYAL NAVAL AMATEUR RADIO SOCIETY**
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## Advertisers Index


| | |
|---|---|
| bhi | 21 |
| ICOM UK Ltd | 78, 79 |
| Labtronix | 85 |
| LAM Communications | 99 |
| Martin Lynch & Sons | 2, 3, 4, 49, 50, 51, 52, 92, 100 |
| Moonraker | 28, 29 |
| Nevada | 57, 58, 59 |
| Radioworld | 70, 71 |
| RF Parts Company | 85 |
| RSGB | 9, 11, 23, 75, 75, 83, 87 |
| RT Systems Inc | 87 |
| SDR-kits | 85 |
| SDRplay | 41 |
| SOTAbeams | 25 |
| Telonic | 93 |
| Upshot UK Ltd | 85 |
| Waters & Stanton | 33, 34, 35, 36 |
| Yaesu UK Ltd | 17, 65 |



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We encourage all Members to comply with the latest Government guidance regarding meeting to pick equipment up as well as social distancing. Please keep yourself and others safe.

## FOR SALE

**64 ASSORTED PIC ICs** and 6 PICAXE, Velleman and PICkit programmers, development boards, 6 tutorial books, disks and alphanumeric displays, £40 ONO+£6.99 post. G-WHIP FLEXITEN with set of 6 loading coils, £20+£5.99 post. Trevor Lumb, G0ARU, 01284 754318, plumb@clara.net (Bury St Edmunds).

**BRAND NEW BOXED PA5070-11-6BG** 4 & 6m antenna. I paid £259 at Nevada. See spec at www.antennas-amplifiers.com. I'm looking for £220 inc carriage. Real bargain with Es season. UK only. G8HUA, 0780 734 1497, mike.delbank@gmail.com (W Yorks).

**COBRA** marine band h/held, pristine, with rechargeable batteries, belt clip. £50. Hoxin 2/70 mobile ant., 80 inches, £15 collect only. Alan, G7CDK, 0741 914 1801, aj.flo@uwclub.net (March, Cambs).

**ELECRAFT K2/100** with K160RX, KSB2, KAF2, KNB2 options, MD2 (Heil) microphone, manuals, leads. 100% working order. See www.g3vgr.co.uk for more info. Smoke and pet free home. £550 plus carriage at cost, or collect (free PSU if collecting). Dave, G3VGR, 0738 887 9963, g3vgr@qsl.net (Buckhurst Hill).

**ELECRAFT KX3** with USB programming cable. Condition absolutely as new. Used for occasional listening only. Complete with manual, 12V power lead and original shipping box from Elecraft. £895. P&P extra. Terry McCurry, G3VSK, 0773 835 7070, twmccurry@btinternet.com (Rotherham).

**ICOM IC-703** HF, 50MHz inc 5MHz. Built-in ATU. Ideal SOTA, portable, mobile. 10W max. Bought for emergency backup indoors only, perfect condition, original screen protector, box, instruction manual, hand mic, unopened plugs, fuses. DC cable fitted powerpoles. £490. Ricky, MW6GWR, 01202 232576, radio@webshack.uk (Welshpool).

**ICOM ICR8500** boxed, as new £675. Icom ICR7100 £275. Icom IC-735, CW filter, boxed, £325. AMP UK 2kW ATU, £295. FT-290 mk2, boxed, as new, £235. FT-101ZD mk3, all options fitted, mint condition, £295. G0NMP, 0742 189 7776, patrickc359@googlemail.com (Norfolk).

**MFJ 904H ATU.** Few months old. In good condition, £85. G3WEJ, 0770 784 4031, bradlys@uwclub.net (Dawlish, Devon).

**SHACK CLEARANCE**: Panda Cub Tx. Mechanically sound but not tested, £85. AR88D, working, clean condition, £145. Army 76 set, untested, with dynamotor fitted, £120. Revophone cat's whisker crystal set, working, needs TLC, £75. Offers considered. Geoff, G3WZP, 0777 255 4549, geoffg3wzp@gmail.com (Bournemouth).

**SHACK CLEARANCE.** Icom IC-746, £450. Yaesu radios FT-818ND, £475; FT-2000D, £1250; FTDX5000MP with SM5000, £2250. All ONO. Items in VGC, owned from new, occasional use in a non-smoking shack, original boxes with manuals, photos on request. Martin, M1CGB, 0797 656 6875, martin@m1cgb.co.uk (Halesowen).

**SILENT KEY DISPOSAL.** Yaesu FTDX101D plus FTDX101MP Silent speaker. Used for approx six weeks before owner (GM3KHH) went SK in Jan this year. Radio is in original packaging with supplied accessories and is as new, including manual. £2400. Also Yaesu FT-3000 in superb condition, only £850. Fixed price. Victor Robertson, 2M0JVR, 07860176295 jvr911@yahoo.co.uk (Fochabers IV32, Moray)



**VERSATOWER SYSTEM P60** complete with all instructions, ready for installation. It has a Daiwa rotator, with 29 metres of cable and an upper bearing unit. An electric winch with 16 metres of cable and a spare steel cable. £800. Michael Watson, G3WMQ, 01453 833 008, watson.g3wmq@btinternet.com (Nailsworth).

**STRUMECH VERSATOWERS.** I have a 30' (short 3 sections), a 60' (3 sections) and a heavy duty 80' (4 sections) masts to sell. All surplus to requirements and dismantled, all three with rotator cages. £300, £500 and £1,000 respectively. David Bowyer, M1AEI, 07802 759 284, info@davidbowyer.co.uk (mid Devon).

**ULTRABEAM UB20MX** HF beam 6-20m Yagi. New 27 July 2018, little used. All EHUs; switch and control box (re-programmed). Returned by WiMo Germany certifying all in good working condition18 March 2020 with workshop reports. Open to offers. Keith, G4GUK, 01249 714788, keithsg@yahoo.co.uk (Wiltshire).

**VERY LARGE DISCOVERY 70** 1500W 70cm linear, the only one in UK. 2x30-ele 70cm aerials with power divider & cables. Icom IC-9100, fully loaded, even D-Star & 1296. £3,000 the lot. Health poor. Trev, G2KF, g2kf@btinternet.com (Cornwall).

**YAESU FRG 7700** Rx with Antenna Tuner. Covers 150kHz to 29.9MHz AM, SSB, CW and FM with 12 memory frequencies. Quartz digital clock to switch the set on and control an external record facility. OIRO £300. Silent Key. Prefer buyer collects or plus carriage. John, G4HOY 01427 872522, john.fennell471@btinternet.com (S Yorks).

**YAESU FT-757GX** transceiver & boxed Yaesu MH1-BB hand mic. Also included Yaesu FC-757AT automatic antenna tuner & leads, bound reprint of manual, from a non-smoking home. £325 plus carriage at cost, or collect. A Strong, G3WXI, 0114 2881692, g3wxi@qsl.net (Sheffield).

## SPECIAL EVENT STATIONS

| Start date | Callsign | Information | Location |
|---|---|---|---|
| 01/07 | GB100GKU | Devizes Radio | Somerset |
| 01/07 | GB8RTB | Rough Tor Bodmin | Camelford |
| 01/07 | GB0GKU | Golf Kilo Uniform | Burnham-on-Sea |
| 01/07 | GB6MRR | McMichael Radio Rally | Reading |
| 01/07 | GB8CVH | Cuerdale Viking Hoard | Preston |
| 01/07 | GB0RAF | Royal Air Force | County Durham |
| 09/07 | GB5FI | Flat Holm Island | Cardiff |
| 10/07 | GB9LQV | Lima Quebec Victor | Lisburn City |
| 12/07 | GB100RS | Royal Signals | Chilwell |
| 15/07 | GB1CS | Cumbria Steam | Flookburgh |
| 22/07 | GB1EMF | EMF | Ledbury |
| 23/07 | GB4EMF | Electromagnetic Field | Ledbury |
| 26/07 | GB100RS | Royal Signals | Bishop Auckland |
| 31/07 | GB2YD | | Huddersfield |
| 31/07 | GB8YD | Yorkshire Day | Holmfirth |
| 31/07 | GB4YD | YD | Huddersfield |
| 31/07 | GB5YD | Yorkshire Day | Huddersfield |
| 31/07 | GB0WRD | World Ranger Day | Basildon |

## WANTED

**70cm MULTI MODE MOBILE** Panda PR120V Tiger 200-300 AM transmitters. GM3UCI, 01555 770914, gm3_uci@yahoo.co.uk (nr Glasgow).

**CALIBRATOR FREQUENCY CT432** manual and service information needed please. Also a copy of the *TOKO RF Catalogue* published by Cirkit in the 1990s. Originals to copy or digital copies welcome. Simon, G8POO, 0786 089 2222 (Corbridge).

**DAIWA CNW-419** manual antenna tuner, Datong ASP speech processor with 8 pin in/out and in GWO. Any associated cables if possible. Please state condition, include pics & price. Sean Martin, 2E0EZE, 0793 247 4932, arctree1@gmail.com (Weston-super-Mare).

**ICOM FL-52A FILTER**. David Newman, G4GLT, 0797 715 4639, davidnewman55@icloud.com (Devon).

**KW VANGUARD** or Valiant AM HF transmitter. Clean tidy and working condition preferred. Gary, G4FTL, 0790 984 6140, jackiewoody@aol.com (Northamptonshire).

**LOOKING FOR A YAESU FP-800** power supply. Good price paid for a clean unit in good working order. Mike, G8GYW, 0789 028 9943, mail@dunstan.uk (Reading, Berkshire).

**MARCONI LARKSPUR D11 AMU**. Very large ATU. Any information circuits or user manual – would love to know how to operate it. Barry, G1NPN, 0790 012 3495, ukbaz1@yahoo.co.uk (Wirral, Merseyside).

***RADCOM*** December 2004 and July 2013, to complete my archives. Frank van Vloten, ZR5CG, vanvlotenft@gmail.com (South Africa).

**TRIO TR-2300**. Working and unmodified please. Ken, G3XSJ, 0787 897 0177, g3xsj@btinternet.com (Bristol).

**VERSATOWER WANTED**. Heavy duty 3 or 4 section tower (20ft sections). John, G0JFP, 0792 777 4171, g0jfpm3eaa@gmail.com (Rochdale).

## HELPLINES

I'm looking for a Structural Engineer familiar with BS EN 1991-1-1:2005. If you are he or she, please email me. Hal, G3NMH, hal@villa-spain.com.

Looking for info on using the 20m Ampro mobile whip for base station use. I am having problems matching the whip even using an MFJ Versa Tuner 3. Has anyone checked base impedance etc using an antenna analyser? I am earthing one side to a ground spike. I can tune for minimum reflected power but performance is abysmal. Owing to my flat balcony situation the antenna is only about 2m from the ground but as the antenna is designed for mobile use this shouldn't be a problem. Any help would be appreciated. Mike, G3XLB, 0151 216 2210, mikegiddings1@yahoo.com (Liverpool).

## RALLIES & EVENTS

**The present Covid-19 restrictions on movement and gatherings have meant a number of rallies have been cancelled or postponed. Even once the restrictions are relaxed we strongly recommend you check with organisers before you travel.**

**The following list reflects our best information as of 8 June 2020. We will continue to keep the online list at https://rsgb.org/main/news/rallies/ as up to date as possible.**

**If you are organising an event, please keep us updated by email to radcom@rsgb.org.uk and we'll put details here, on the RSGB website and on GB2RS News.**

4 July (Saturday)
Stockport RS Rally
POSTPONED
[www.g8srs.co.uk]

5 July
Cornish Radio Amateur Club Rally
CANCELLED

5 July
Barford Norfolk Radio Rally
CANCELLED

12 July
McMichael Radio Rally and Boot Sale
CANCELLED
[https://mcmichaelrally.radarc.org ]

19 July
Finningley ARS Rally
POSTPONED

2 Aug – Red Rose Summer Rally
[www.wmrc.co.uk]

## SILENT KEYS

We regret to record the passing of the following Members.

| Name, Callsign | Date |
|---|---|
| Mr D J Lawrence, G0RTQ | 15/04/2020 |
| Mrs D Pugh, G0SJS | 28/04/2020 |
| Mr P T Pitts, G3GYE | 12/05/2020 |
| Mr J R Morgan, G3HAA | 08/05/2020 |
| Mr R Strafford, G3MRT | 5/2020 |
| Mr J P H Burden, G3UBX | 06/05/2020 |
| Mr J B Anderson, G4DBP | 07/05/2020 |
| Mr R H Thomas, G4GCQ | |
| Mr E C Holmes, G4TLY | 25/04/2020 |
| Mr C D Williams, G6AMW | 07/01/2020 |
| Mr R D Mount, G7DOE | 17/04/2020 |
| Mr K Liddle, G7TRG | 22/04/2020 |
| Mr R Dunn, G8GDI | |
| Mr J Reed, RS309083 | |

To notify us that a Member has passed away, please email details to sales@rsgb.org.uk or phone 01234 832 700, option 1. We need to know the Member's name, callsign and, ideally, date of death.

*Ofcom should also be informed. Phone them direct on 0300 123 1000.*

2 Aug – King's Lynn ARC Gt Eastern Radio Rally
[www.klarc.org.uk]

2 Aug – CANCELLED – Crianlarich Radio Rally

9 Aug – CANCELLED – York RC Radio Rally

9 Aug – CANCELLED – Flight Refuelling ARS Hamfest

14 Aug – Cockenzie & Port Seton Mini Rally

23 Aug – Rugby ATS Rally

30 Aug – Torbay Annual Communications Fair

30 Aug – CANCELLED – Milton Keynes ARS Rally

31 Aug – HARS Annual Rally

5 Sep – CANCELLED – Telford Hamfest Buildathon

5 Sep – Caister Lifeboat Rally

6 Sep – CANCELLED – Telford Hamfest & G-QRP Convention *[STOP PRESS: see page 12]*

20 Sep – Weston-super-Mare Radio Rally

25-26 Sep – NATIONAL HAMFEST

4 Oct – Welsh Radio Rally

9-11 Oct – RSGB CONVENTION

18 Oct – Hornsea Amateur Radio Rally

24 -25 Oct – BATC Convention for ATV (CAT 20)

25 Oct – Galashiels Rally

1 Nov – Holsworthy Radio Rally

22 Nov – Bishop Auckland RAC Rally

28 Nov – Rochdale & District ARS Rally
Re-arranged from June

25 Apr 2021 – NARSA (Blackpool Rally)

20 Jun 2021 – West of England Radio Rally

25-27 Jun 2021 – Ham Radio Friedrichshafen

## VDSL INTERFERENCE

**Julian Forsey, G4ETS**

In response to the President's call to action, in the May edition of *RadCom*, I checked for VDSL interference at my QTH. I have background noise levels of S8 on 80m, S6 on 40m and S4 on 20m (all CW).

As I already use SDR Uno with an SDRPlay receiver to give me a panoramic display, it was an easy task to download, install and use the excellent Lelantos software. Sure enough, there were huge VDSL interference spikes. So, I complained to Ofcom and wrote to my MP.

I was pleased to receive an immediate response from my MP. She wrote to BT Openreach. Sure enough, BT quickly contacted me to say that they didn't know why I was complaining, as they had checked, and my broadband speed was stable and excellent at 60Mbps, which shows that the wiring is okay. Of course, I wasn't complaining about the broadband speed at all, but hey.

I also got a prompt response from Ofcom. They asked me to fit the latest NTE5C linebox and Mk 4 VDSL filter to my broadband installation, which I did. They also asked me to run the rig from a battery and switch off the mains to the house, which I did. The noise floor dropped by approximately half an S point. Finally, they asked me to send them a week's log of my activities, which I did. Then Ofcom's Duty Engineering Officer phoned me to say they were closing the case, because there was no danger/safety aspect, and no harm being caused (because I had been able to make contact with numerous stations during the CQ-M DX Contest). I pointed out that the numerous stations all had S9 signals, above the noise floor, and that I had not heard any distant stations with S6 or less signals, below the noise floor. She asked how I knew that anyone with a weak signal had actually called me, because I didn't hear them. A perfect example of a circular argument! I pointed that out, but received an email ten minutes later saying that the case was closed.

In conclusion I am well able to understand why radio amateurs tend not to bother to complain to Ofcom. My complaint cost me £75 (the VDSL box and fitting), and got me nowhere. Perhaps next time I'll just head-butt the wall for a while – same outcome but cheaper! Keep up the good work RSGB, I hope that the increased volume of complaints has some positive outcomes.

*Thanks for responding to our call for action. I am sorry that Ofcom gave you the wrong advice in this case. Openreach have a separate department for handling complaints about interference and they will do line balance checks on all lines near you that may be causing a problem at our request. Please email emc.chairman@rsgb.org.uk if you wish us to help organise this for you.*

*Can I stress how important it is for everyone who submits a VDSL complaint to Ofcom also copies us at vdsl@rsgb.org.uk so we can build a complete picture to support our approached to Ofcom for action? If you have not told us of your complaint please forward a copy including any replies you get to vdsl@rsgb.org.uk.*

***John Rogers, MOJAV, RSGB Director***

**David Lloyd, G8UOD**

At the end of April, I went on my rig to listen to 2m as the lockdown seemed to be making VHF and UHF more active. Unfortunately, I was met with a large hum across 50kHz of bandwidth, which seemed to be moving across the 2m band. I had not heard anything like this before on this frequency range. It was there at 0900 on 1 May, blocking the calling frequency.

I periodically monitored the noise making a note of the frequency range and level. By mid-day I had had enough and sent of an online complaint to Ofcom, who responded by phoning me and left a message to call them back.

The Duty Engineering Officer (DEO) was very helpful and I set about isolating my own equipment and household services. After turning off the power and using a DC source the noise persisted. I switched off the solar panels inverter the problem still existed. The broadband was turned off, still there.

By mid-afternoon I was out with my handheld walking the street, where the noise was being picked up some 200 metres from my QTH in all directions. Back in the shack I made some recordings of the noise on narrow FM, wide FM and AM to compare on AM; the signal level went up as high as S7.

I contacted the DEO with my findings and they explained to me that they would investigate the problem, however if the problem was on my premises, they would charge £91 plus VAT per hour. I agreed to the costs and left it with them.

On 4 May I rang the DEO and asked how things were progressing, understanding the situation with Covid-19. I was asked if I minded Ofcom passing my details on to Openreach.

After further conversation and an email the DEO confirmed that the problem was with Openreach in the form of VDSL. Openreach would contact me direct.

I monitored the band through to 18 May, having not heard a thing from Openreach. At 2340 hours the noise had gone. On 19 May the band was quiet apart from QSOs. I am monitoring the band each day and there is no noise. Openreach have not yet made contact.

I have suffered from noise on the HF bands, but then most people do at this time, unfortunately for me Openreach have installed two fibre optic cabinets outside my home and I also have a telegraph pole with several drop-wires radiating to the local houses.

As for the process, Ofcom could not have been more helpful and hopefully Openreach have done something to resolve the problem. It would been nice if they had contacted me.

*If the noise was on VHF/UHF it is not VDSL, which stops at about 18MHz for the common VDSL2 variant.*

*I am delighted that Ofcom were so helpful. Maybe it was a fault in an Openreach cabinet or a faulty line but I suspect it was something unrelated nearby from the characteristics you describe that just went off.*

*Also, it is virtually impossible to diagnoses VDSL from hearing the audio signal as it is very wide band white noise.*

*It may be worthwhile you doing the VDSL checks described in May* RadCom *as you will probably be suffering Harmful Interference at HF from those cabinets outside your home. With the help of people like yourself we can highlight the size of the problem and hopefully persuade Ofcom to take some action against it.*

***John Rogers, MOJAV, RSGB Director***

**Philip Redfern, G4CLN**

Having read the Call to Action on VDSL in the May *RadCom*, I emailed Ofcom on Sunday afternoon, 10 May, complaining about VDSL interference. To my surprise, despite it being Sunday afternoon, I received a telephone call from the Duty Engineer at Ofcom within 30 minutes.

He was very helpful and told me there is someone on duty 24 hours a day. He asked for further information that I have supplied.

So, Ofcom do take complaints regarding VDSL seriously.

It is worth complaining.

**Alan, G3PNQ**

Using my basic knowledge, I know that an alternating current, flowing in a metallic wire radiates an electromagnetic field, which in turn can induce a current to flow in another metallic wire within the radiated electromagnetic field. Therefore, considering that fact, I feel the problem of VDSL interference, is a problem that is impossible to solve. However, the problem must be solved. Not having a PhD in anything, I decide to consult Farmer Boycie's House Cleaner, (Imelda Cakeworthy). Mrs Cakeworthy advised, we should all have fibre optic cable into our homes, and as long as the interfacing apparatus (she used to clean for the GPO) was suitably engineered, the problem of VDSL interference would be no

more. So there we have it, the way to go is to convince the public fibre into the home is the in thing (stop all this radiation from wires), Added to that it would be more economical than taming an open wire system that was originally only put in place to carry telephone (audio) traffic.

## IDLE THOUGHTS ON STILLWATER FLY FISHING AND FT4

**Eric Tucker, G3TXZ**

Sitting at my keyboard one morning, contemplating a completely empty 30m FT4 waterfall, I decided to call CQ to see if I could raise any interest. After about a dozen calls without any response I ceased my CQing, thinking that I should find better things to occupy my lockdown time, only to be called about 20 seconds after I had stopped by an Italian station (thank you, Carlo). The brief QSO ensued, with reasonable signal reports, showing there was propagation. Off I went CQing again with another dozen or so calls, only to get no takers. I stopped CQing, but after a further 20 seconds, or so, and just as I was going to switch mode to FT8 where there was more activity, another station called me and was worked.

In idle contemplation, my mind turned to another passion of mine: fly fishing for trout on my local lakes and reservoirs – an activity that I was sorely missing due to the virus restrictions. Often I had found that I could be retrieving my fly for some time with no fishy interest whatsoever and yet it was only when I stopped retrieving that a fish decided to bite. This happens not infrequently and is a tactic that can be quite productive in catching trout.

So, I started CQing again and then stopped, and again and stopped, and again, without further response.

Just like fishing!

Stay safe.

## ON AIR MANNERS?

**Denis Speirs, 2M0DOI**

Last evening Thursday (21 May) I was listening on the 80m band as I sometimes make a QSO of an evening on 80. Tuning round at about 2100UTC on 3.757MHz I heard two operators having a chat. The initial conversation from one of them was about a battle a few hundred years ago. Apparently, people were bludgeoned and stabbed to death, including wounded men. All history; however he made the comment 'made the Somme look like a picnic!'. After a short over he continued that the battle in all its gory detail was like 'Glasgow on a Saturday night!' The operator then went on to criticise those that take part in contesting with 'its 5 & 9, 5 & 9 all the time', further he said 'then someone calls in from outer Mongolia without a callsign'.

I have no interest in contesting but would not rabbit on as above on the air. The comparison re the battle discussed and belittling the Somme beggars belief. The comment about Glasgow? OK I am a Scot but not a Glaswegian, but the comment was rude to the extreme.

If either of them read this, please remember on air protocol, rules and manners. I am no youth (I will be 73 years old soon) and I have never heard the like before.

## SOLVING TVI

**Jukka Siitari, SV9RMU (also OH2AXE)**

I just finished reading G3WZP's article 'TVI – a case history' in May's *RadCom* (pages 44-45). Very interesting reading! It gave me an idea to tell you about my own solution.

A couple of years ago I also severe TVI problems but, in my case, with our own TV. My wife complained that the TV went blank every time I transmitted on the HF bands. Even 5W WSPR transmissions caused a 'no signal' message in the TV set. Unfortunately my TV antenna is very close (about 3 to 4m) from my amateur antennas (Hexbeam for 20 to 6m and a 45m long OCF doublet for all HF bands), but there is no space on our small flat part of the roof to have a larger distance.

All terrestrial TV signals here in Greece are digital and in the UHF band (bands IV and V). Here in Crete (near Chania) we have, at the moment, 20 terrestrial TV channels. It came very quickly obvious that the reason was overloading my wideband TV (and FM) antenna amplifier in the TV antenna mast. Although the amplifier has separate inputs for Low VHF (band I), FM (band II), high VHF (band III) and UHF (bands IV and V) antennas, the internal input filters for those bands are not very good and whoever designed that amplifier did not consider interference from any other transmissions (including ham radio). So, I designed passive FM bandpass and UHF high-pass filters, installed them in a waterproofed metal box, connected the filters between antennas and amplifier and all interference problems disappeared. Even 100W (my max power) caused no TVI, not even for the low power local TV channels. The filters were designed for 75Ω inputs and outputs. The theoretical attenuation for all HF amateur bands (160 to 10m) is:

- FM bandpass filter: better than -110dB, -3dB passband 83.7-114.3MHz
- UHF highpass filter: better than -120dB, -3dB point 407MHz

75Ω SWR:

- FM bandpass filter: 1.02:1 to 1.55:1 within the FM radio band (87.5-108MHz)
- UHF highpass filter: 1.02:1 to 1.22:1 within the UHF TV band (470-957MHz)

I have not measured the real attenuation nor SWR. All coils and capacitors were measured with an LC meter to have better than 1% tolerance to the calculated values.

*[At the time of going to press we are discussing with Jukka about publishing his design, so watch this space! – Giles, G1MFG, Technical Editor]*

## FRONT END ATTENUATORS

**Michael O'Beirne, G8MOB**

I have been following the thread of using front end attenuators, and one might be led to think that this is a fairly new idea. It certainly is not!

Professional receivers have incorporated front end attenuators for over 70 years, typically the CRD150-20 of 1950 vintage, the rare diversity version of Marconi's CR150. The best-known early receiver with an attenuator is Racal's RA17 of 1957 onwards.

Amateur receivers with front end attenuators came along a lot later. The earliest I know of was the Heathkit SB303, first released in about 1971. It was reviewed in *Radio Communications* in May 1972 and that carried a lengthy introduction to explain the benefits of using an attenuator.

The *TT* column of the late (and much missed) Pat Hawker, G3VA touched upon the benefits of attenuators from time to time. In his *Amateur Radio Techniques* (1969) he mentions the advantages of a front end attenuator in reducing not only the signal input but also any spurious signal breakthrough to the point where there is no signal overload. That was as valid in those far-away days as it is now. Some professional DSP receivers were using front end attenuators as late as 1998 (eg the Marconi H2550) and the current Icom IC-R9500 has one.

I endorse G3XJP's view that it is important to use an attenuator to bring the noise level entering a receiver or transceiver down to a level that will not overload it, and that this should be done **before** trying to deal with the noise using DSP techniques. This is done with all spectrum analysers, albeit to ensure the greater accuracy of the display, but the principle is the same.

An interesting technique used in several professional receivers is to use fixed gain amplifiers, and ahead of each amplifier is a variable attenuator controlled by the AGC.

If properly engineered, this is a most effective technique. Examples are Redifon's R551 and Telefunken's E1800.

## THANK YOU FOR THE HELP

**Nicholas Wilkinson, G4HCK**

Recently I decided to update my station investing in a Kenwood TS-890. For many years I had run a KW Atlanta before moving onto a Kenwood TS-570, which I still process. The move from the KW to a Kenwood was my first move into the modern day transceiver. What an excellent set the TS-570 was and I had a lot of fun using it over the years, so when I decided to update the 570, Kenwood was top of the list. I looked at the TS-990 but that was definitely a step too far. In fact, when I went to purchase it at Martyn Lynch & Sons, they in effect talked me *out* of buying it. Looking back, what

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an excellent recommendation. So, when I decided to purchase the TS-890 it was back to ML&S. I finally got the rig back home and then I started to find my way around the set. Within a few minutes of having it into the shack I managed to switch off the Tx side. That took two hours to find out what I had done. Anyway, I have owned the set a few months now and I wanted to connect SSTV and FT8 to the rig. I read the manual and decided I still did not understand what to do so reverted to the internet. There I found a video describing how to set up FT8 from the computer to the rig. It talked about virtual com ports. This was interesting and something new. Other than the City and Guilds RAE all my degrees are in the social sciences, so *virtual* ports – what could I say? I followed the instructions on the net and it did not work. I decided to contact Mark, MOMGX via email and very quickly back came a reply. Following a couple of emails, he had soon spotted what I had done wrong and hey presto FT8 and SSTV work. I would via this magazine like to say a big thank you to Mark, MOMGX. I am now looking at other videos he has put up on the web. All very useful.

**John Haskell, RS329197**

Thank you for the reception. Not reception on the airwaves, but the reception I have been given by Harwell ARS and the RSGB customer facing teams. I cannot speak highly enough about all the people in Harwell ARS. They have been offering free membership of the club since the lockdown. They have organised two chats a week on Zoom conferencing, which works very well. It was at their suggestion that I join RSGB and try for the Foundation course. I have now booked a test in June and HARS are going to organise a session on Zoom to answer questions and help support us before our test. There are, I gather, over 20 new members of HARS. I just want the RSGB to know what a good organisation you are, helping at all times us beginners and mostly by volunteers too. I wonder if HARS can receive any recognition for their work?

## THURSDAY CLAPPING FOR THE NHS

**David Dabinett, GW4DEP**

I thought you may be interested in my effort to support the Thursday evening 8pm NHS clapping.

I live in a scattered community in Mid Wales. When the Thursday evenings NHS clapping effort started, I did not hear anyone. So, the following week I tried keying NHS, NHS, NHS, for a minute on my car horn. This proved difficult and clumsy as the horn knob on my car is quite stiff to manipulate.

So, by the following Thursday, I had managed to scavenge a working scrap car horn and a 12 volt 30 amp relay. I built a car horn sounder 'open frame style' on a scrap piece of plywood with a Morse key, keying the relay.

From my bedroom window at 8pm on Thursdays I now send in 'air wave mode' slow Morse for one minute: VVV VVV VVV NHS NHS NHS, repeated. The Vs are of course Churchill's V for victory.

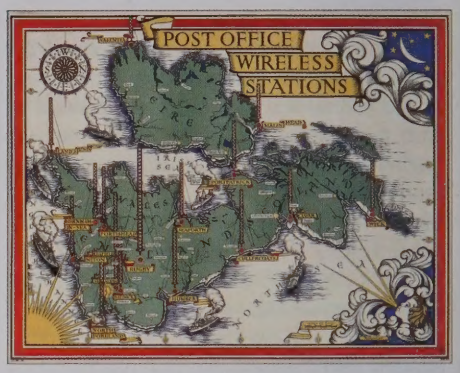
## REQUEST FOR HELP

**Paul Thompson, GM6MEN**

I am a PhD candidate at the University of St Andrews. My PhD supervisor, Dr James Purdon, currently lives in Cupar, Fife, and the other day I noticed a tweet from him showing McDonald Gill's 1937 pictorial map of GPO wireless stations. One of his research fields is the early history of radio, specifically the intersections and influences between technology and early twentieth-century literature, and he was delighted – if a little embarrassed – to find that there had been a GPO wireless station close to where he lives, without his being aware of it.

It is a documented fact that the GPO were asked, in 1937, to build an installation at Hawklaw, just outside Cupar. Its covert purpose was to collect information for Bletchley Park. Asking around locally, on the air, I found at least one Fifer who knew that Hawklaw and the nearby station at Kemback were part of that network, and later were connected to a NATO installation in Dunfermline.

It occurred to me that as the amateur radio fraternity has many members, past and present, who worked for government and commercial telecommunications bodies, it was not inconceivable that someone out there either had worked at Hawklaw or Kemback, or has a relation living or deceased, or a friend, who worked there. I have offered to ask fellow Members of the RSGB, on Dr Purdon's behalf, if they would kindly get in touch if they have any information. Dr Purdon has taken me up




on this offer. As a researcher myself, in a different field, I know that the smallest piece of information can often be very valuable, so would anyone who has information with any connection to the radio station(s) in Cupar, kindly get in touch?

Please email jjp5@st-andrews.ac.uk or write to Dr James Purdon, University of St Andrews, School of English, Castle House, The Scores, St Andrews, Fife KY16 9AL.

## AZIMUTHAL MAP

**Bob Houlston, G4PVB**

Wikipedia: *"The azimuthal map projection has the useful properties that all points on the map are at proportionally correct distances from the centre point, and that all points on the map are at the correct* ***azimuth*** *(direction) from the centre point."* For amateur radio this means that an azimuthal map will enhance where you point your beam antenna. Steve, VE7SL: *"The map generator link here is the brainchild of Tom, NS6T, and can be found on his HAM STUFF website along with some other interesting bits. The user interface is simple and map generation times are fast. Anyone with a beam will likely be interested in this, should they not already have a great circle map for their present QTH."*

You can find it at tinyurl.com/azimuthalmap

## TITANIC RADIO EQUIPMENT

**Mike Stewart, G4RNW**

I note in the daily press that there are plans to extricate the radio equipment from the wreck of the *Titanic*. I feel that this is a good move. I understand that there is some sensitivity plus objections to disturbing what is after all a grave for over 1500 people. However, it is now 108 years since the incident and all of the then-contemporary relatives, and their children, will by now have passed away. I agree that personal remains and any bones still extant should be left undisturbed. But the radio is/was the property of the shipping company and as such has enormous historical value and interest. It should be restored and put on display at either the Smithsonian in the USA or the Science Museum in London.

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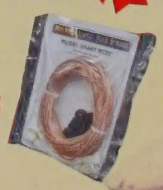

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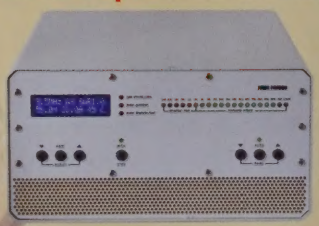

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